AD-A187 602 SPECIAL FLOOD HAZARD EVALUATION REPORT MAUMEE RIVER HENRY COUNTY OHIO(U) CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT SEP 87 1/1

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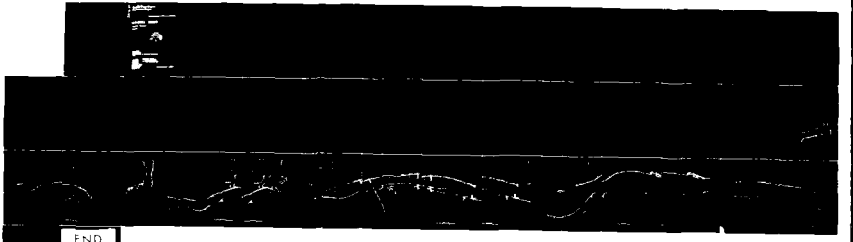

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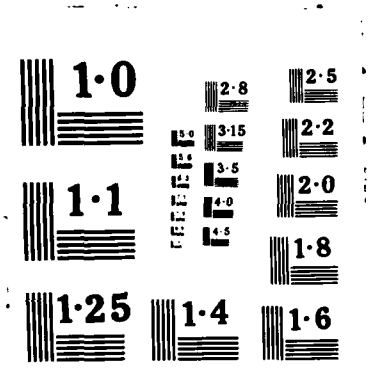
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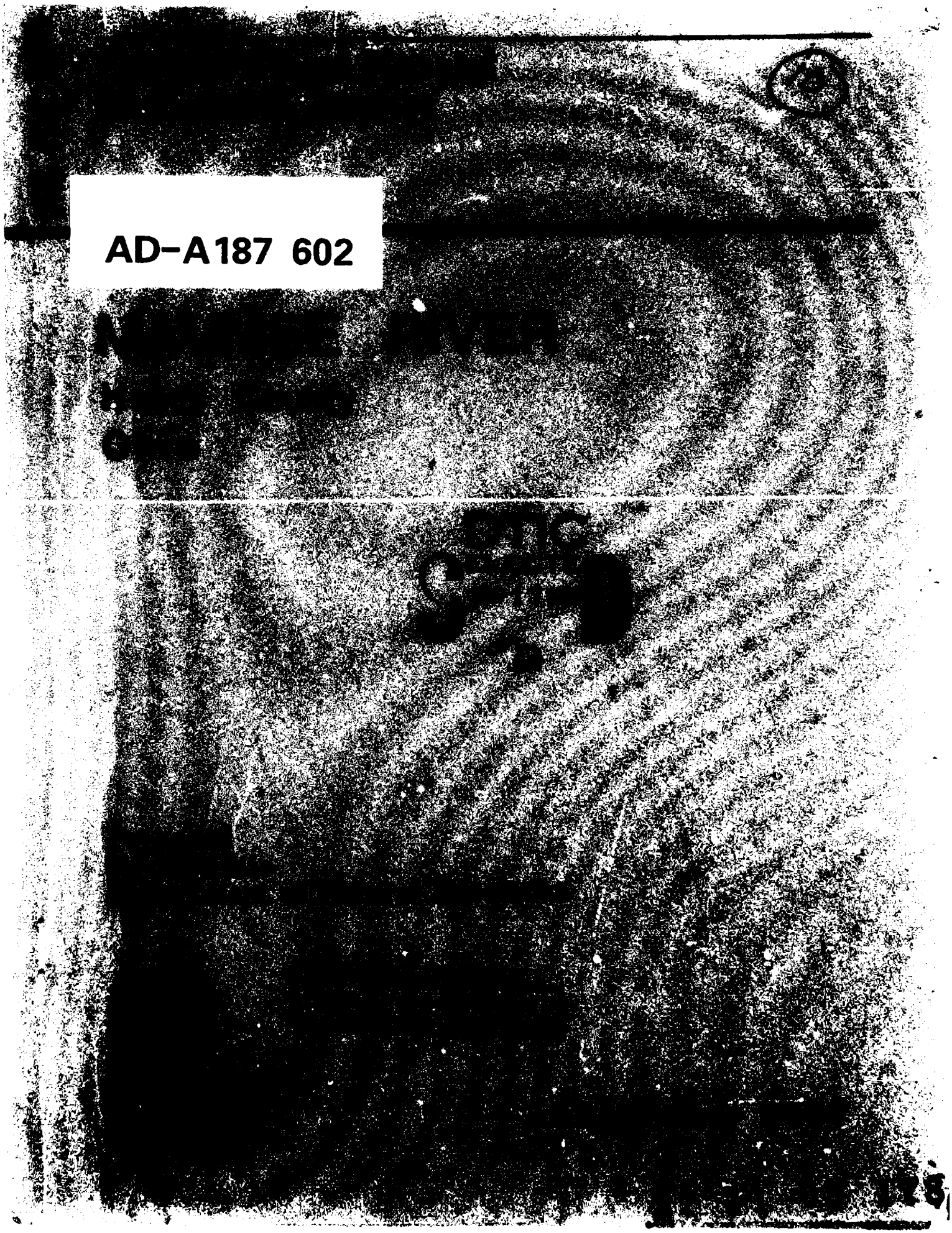
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Flood Boundaries
Flood Plain
Flood Profiles
Floodway
Flood Plain Management

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides information on the flood plain, floodway, and flood profiles for a selected reach of the Maumee River within the state of Ohio, for use in a flood plain management program.

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Unclassified.
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SPECIAL FLOOD HAZARD
EVALUATION REPORT

MAUMEE RIVER
HENRY COUNTY, OHIO

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SPECIAL FLOOD HAZARD EVALUATION REPORT

MAUMEE RIVER HENRY COUNTY, OH

INTRODUCTION

This Special Flood Hazard Evaluation Report, prepared at the request of the Ohio Department of Natural Resources, investigates the potential flood situation along the Maumee River for its entire length in Henry County, with the exception of the city of Napoleon, which has previously been studied under the National Flood Insurance Program. Most of the area along the river in Henry County is predominately rural with the only city being Napoleon.

Knowledge of potential floods and flood hazards is important in land use planning. This report includes a history of flooding along the Maumee River and identifies those areas that are subject to possible future floods. Special emphasis is given to those floods through the use of maps and water surface profiles. While the report does not provide solutions to flood problems, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevents intensification of the flood loss problem. It will also aid in the development of other flood damage reduction techniques to modify flooding and reduce flood damages which might be embodied in an overall Flood Plain Management (FPM) program. Other types of studies, such as those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings, would also profit from this information.

Additional copies of this report can be obtained from the Ohio Department of Natural Resources until its supply is exhausted and the National Technical Information Service of the U.S. Dept. of Commerce, Springfield, VA 22161, at the cost of reproducing the report. The Buffalo District Corps of Engineers will provide technical assistance and guidance to planning agencies in the interpretation and use of the data.

PAST FLOODS

People living along the Maumee River have suffered from flooding for more than 100 years. There has been a significant flood (those with a peak discharge greater than 50,000 cfs) at least once in each decade since records have been kept. The main flood season for the Maumee River occurs during the winter and spring months. All of the highest known floods, including the record flood of 1913, occurred during this period. However, floods due to intense local thunderstorms occur in the summer and can cause local flooding on some of the smaller tributaries.

The greatest known flood to have occurred on the Maumee River happened in March 1913. This occurred as a result of two intense storms which passed over Ohio from west to east between the 23rd and 27th of the month. Over a

48 hour period 4.14 inches of rain fell at Napoleon, while between 6 and 7 inches fell over the Maumee Basin itself. The river crested at a gage height of 25 feet at the Weather Bureau river gage on the Perry Street bridge in Napoleon (Reference 1).

Numerous floods have occurred since the 1913 flood with the most recent being in March 1982. During the period from March 11 to March 13, 1982, rain and snowmelt in southern Michigan, northeast Indiana, and northwest Ohio combined to cause major flooding and the loss of seven lives in northwest Ohio. The unusual seasonal weather patterns caused flood levels (a stage of 17.6 feet at the Napoleon gage) throughout the Maumee River Basin. Precipitation over the basin, while the river was near crest, maintained the higher water levels and extended the period of flooding. Damages to Henry County were: 20 percent of farmland flooded, 15 businesses and 65 residential structures damaged. The dollar amount was not calculated (Reference 2).

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past are likely to occur in the future. Similar combinations of rainfall, snowmelt, and runoff which caused past floods could occur again within the study area.

Flood Magnitudes and Their Frequencies

Floods are classified on the basis of their frequency or return period. A 100-year flood is an event whose magnitude can be expected to be exceeded on the average of once every hundred years. The 100-year event has a 1 percent chance of exceedence in any given year. It is important to note that, while on a long-term basis the exceedence averages out to once per hundred years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval.

It should be noted that there is a greater than 50 percent probability that a 100-year flood event will occur during a 70-year lifetime. Additionally, a house which is built at the 100-year flood level has about a one in four chance of being flooded in a 30-year mortgage life.

The 100-year discharges were determined at U.S. Geological Survey (USGS) Gage No. 04192500 near Defiance and at USGS Gage No. 04193500 at Waterville using Bulletin 17B procedures. The 100-year discharge for sites between the two USGS Gages was determined by plotting the 100-year discharge vs. drainage area for the 2 gages and drawing a straight line between the two points. The relationship between 100-year discharge and drainage area for the Maumee River in Henry County is expressed by the following equation:

$$Q100 = (19.1)(DA) + 2,050$$

Where: Q100 = 100-year discharge in cfs
DA = drainage area in mi^2

Table 1 presents the drainage areas and 100-year discharges for reaches in Henry County.

Table 1 - Peak Flows on the Maumee River

From	To	Drainage Area (MI**2)	100-Year Discharge (cfs)
1. Upstream of Beaver Creek	Big Creek	6058	117800
2. Upstream of Big Creek	Bad Creek	6022	117100
3. Upstream of Bad Creek	Dry Creek	5948	115700
4. Upstream of Dry Creek	N. Turkeyfoot Creek	5921	115200
5. Upstream of N. Turkeyfoot Creek	S. Turkeyfoot Creek	5846	113800
6. Upstream of S. Turkeyfoot Creek	Oberhaus Creek	5697	110900
7. Upstream of Oberhaus Creek	Garrett Creek	5655	110100
8. Upstream of Garrett Creek	Benien Creek	5619	109400
9. Upstream of Benien Creek	Wade Creek	5581	108700
10. Upstream of Wade Creek	Auglaize River	5566	108400

Hazards and Damages of Large Floods

The extent of damage caused by any flood depends on the topography of the flooded area, the depth and duration of flooding, the velocity of flow, the rate of rise in water surface elevation, and development of the flood plain. Deep water flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles which attempt to cross the flood plain. Generally, water 3 or more feet deep which flows at a velocity of 3 or more feet per second could easily sweep an adult off his feet and create definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Since waterlines can be ruptured by deposits of debris and by the force of flood waters, there is the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution by floodwaters and could create health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flood Profiles and Flooded Areas

Analyses of the hydraulic characteristics of the Maumee River were carried out to provide estimates of the elevations of the 100-year flood. Cross-sectional data for the river channel were obtained by field survey. Bridges were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Plates 1 and 2). Selected cross-section locations are also shown on the Flooded Area Maps (Plates 3-7).

The 100-year flood profile was generated using the HEC-2 backwater program (Reference 3). The 100-year flood profile was drawn showing computed water surface elevations to an accuracy of 0.5 foot.

Within the study area, the abandoned Miami and Erie Canal runs from the upstream corporate limit of the city of Napoleon to the upstream study limit at the Henry County-Defiance County line. Along portions of this abandoned canal, which runs along the left bank, a towpath levee runs intermittently along the river side of the canal. Because this towpath levee was not constructed for flood control, and because there is little freeboard from the 100-year flood, this towpath levee was not modeled in the computations.

Channel roughness factors (Manning's "n") used in the computations were chosen by engineering judgment and based on field observations of the Maumee River and its flood plain. A roughness factor of 0.022 was used for the main channel of the Maumee River, while a roughness factor of 0.060 was used for overbank areas.

The starting water-surface elevation for the Maumee River in Henry County was taken from the flood profile at the Wood-Henry County line as determined in the restudy of Wood County for flood insurance purposes.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if the bridges across the Maumee River remain unobstructed from debris or ice and if channel and overbank conditions remain essentially the same as ascertained during this study.

The areas that would be inundated by the 100-year flood are shown on the Flooded Area Maps. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the scale of the maps does not permit precise plotting of the boundaries of the flooded area.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown in Table 2.

Obstructions

During floods, debris collecting on bridges could decrease their flow-carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing the profiles. No reduction in the carrying capacity from clogging or jamming was considered. Similarly, maps of the flooded area show the backwater effect of constructed bridge openings, but do not reflect increased water surface elevations that could be caused by debris or ice collecting against the structures.

Table 2 - Elevation Reference Marks in the Study Area

Reference Mark	Elevation (NGVD)	Description of Location
RM1	662.86	U.S. Geological Survey standard disk set in concrete pad located 26 feet north of State Route 65, about 97 feet east of the Wood-Henry County Line, Grand Rapids Township, and 3 feet west of a power pole.
RM2	649.05	U.S. Geological Survey standard disk, stamped "46 DAW 1959 648," is located on State Route 65 bridge over Lick Creek. It is on the south side of the Maumee River in Damascus Township, and is approximately 2.9 miles west of Henry-Wood County line along State Route 65.
RM3	656.22	U.S. Geological Survey standard disk, stamped "45 DAW 1959 656," is set in the concrete base of a 7-foot tall pyramid-shaped concrete monument, which has lettering "Sec. 53 W. & E. C. completed 1842 James Durbin." It is located along the canal towpath on the north side of Maumee Rvier, and is approximately 20 feet south of State Route 24 in the community of Texas, in Washington Township.
RM4	655.53	U.S. Geological Survey standard disk, stamped "48 DAW 1959 656," is located on State Route 110 bridge over South Turkeyfoot Creek. It is located on State Route 110 on the southeast side of the Maumee Rvier in Damascus Township and is approximately 1.8 miles west of the intersection of State Route 110 and State Route 65.
RM5	666.36	U.S. Geological Survey standard disk, stamped "20 DAB 1959," is set in the east end of a concrete slab near the intersection of State Route 109 and State Route 110 in Harrison Township. It is 109 feet east of State Route 109, north of State Route 110, and downstream of State Route 109 bidge over the Maumee River.
RM6	661.26	U.S. Geological Survey standard disk, stamped "21 DAB 1959," is set in the southeast headwall of a concrete bridge along State Route 110 in Harrison Township. It is approximately 0.4 mile west of the intersection of State Route 110 and State Route 109, and approximately 0.6 mile east of U.S. Route overpass over State Route 110.
RM7	663.48	1-1/2 inch steel pipe, set in the center of road intersection of County Road 15 and County Road Z in Flatrock Township. It is on the south side of the Maumee River and opposite of Girty Island.
RM8	670.70	U.S. Geological Survey standard disk, stamped "Ohio Datum 671," is located in the southern part of the village of Florida, Flatrock Township, about 0.1 mile south of Highway 424, and 17.0 feet east of the centerline of County Road Z. It is set in a drill hole in top of the northeast corner of the northeast rock wingwall on the downstream side of the Maumee River bridge.

(1) Approximate location of the elevation reference marks are shown on the flooded area maps.

UNIFIED FLOOD PLAIN MANAGEMENT

Historically, the alleviation of flood damage has been accomplished almost exclusively by the construction of protective works such as reservoirs, channel improvements, and floodwalls and levees. However, in spite of the billions of dollars that have already been spent for construction of well-designed and efficient flood control works, annual flood damages continue to increase because the number of persons and structures occupying floodprone lands is increasing faster than protective works can be provided.

Recognition of this trend has forced a reassessment of the flood control concept and resulted in the broadened concept of unified flood plain management programs. Legislative and administrative policies frequently cite two approaches: structural and nonstructural, for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as public works dams and channel work. "Nonstructural" is usually intended to include all other adjustments in the way society acts when occupying or modifying a flood plain (e.g., regulations, floodproofing, insurance, etc.). Both structural and nonstructural tools are used for achieving desired future flood plain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, economically undesirable, or unwise use of the flood plain. Responsibility for implementing such actions rests largely with the non-Federal sector and primarily at the local level of Government.

These actions include restrictions in the mode and the time of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, absorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between flood plains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce. Implementing mechanisms for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems. Different tools may be more suitable for developed or underdeveloped flood plains or to urban or rural areas. The information contained in this report is particularly useful for the preparation of flood plain regulations.

a. Flood Plain Regulations.

Flood plain regulations apply to the full range of ordinances and other means designed to control land use and construction within floodprone areas. The term encompasses zoning ordinances, subdivision regulations, building and

housing codes, encroachment line statutes, open area regulations, and other similar methods of management which affect the use and development of floodprone areas.

Flood plain land use management does not prohibit use of floodprone areas: to the contrary, flood plain land use management seeks the best use of flood plain lands. The flooded area maps and the water surface profiles contained in this report can be used to guide development in the flood plain. The elevations shown on the profiles should be used to determine flood heights because they are more accurate than the outlines of flooded areas. Development in areas susceptible to frequent flooding should consist of construction which has a low damage potential such as parking areas and golf courses. If high value construction such as buildings are considered for areas subject to frequent flooding, the land should be elevated to minimize damages. If it is uneconomical to elevate the land in these areas, means of floodproofing the structures should be given careful consideration.

b. Development Zones.

A flood plain consists of two useful zones. The first zone is the designated "floodway" or that cross sectional area required for carrying or discharging the anticipated flood waters with a maximum 1-foot increase in flood level. Velocities are the greatest and most damaging in the floodway. Regulations essentially maintain the flow-conveying capability of the floodway to minimize inundation of additional adjacent areas. Uses which are acceptable for floodways include parks, parking areas, open spaces, etc.

The second zone of the flood plain is termed the "floodway fringe" or restrictive zone, in which inundation might occur but where depths and velocities are generally low. Such areas can be developed provided structures are placed high enough or floodproofed to be reasonably free from flood damage during the Base (100-year) Flood. Typical relationships between the floodway and floodway fringe are shown in Figure 1. The floodway has been plotted on the Flooded Area Maps, Plates 3 through 7.

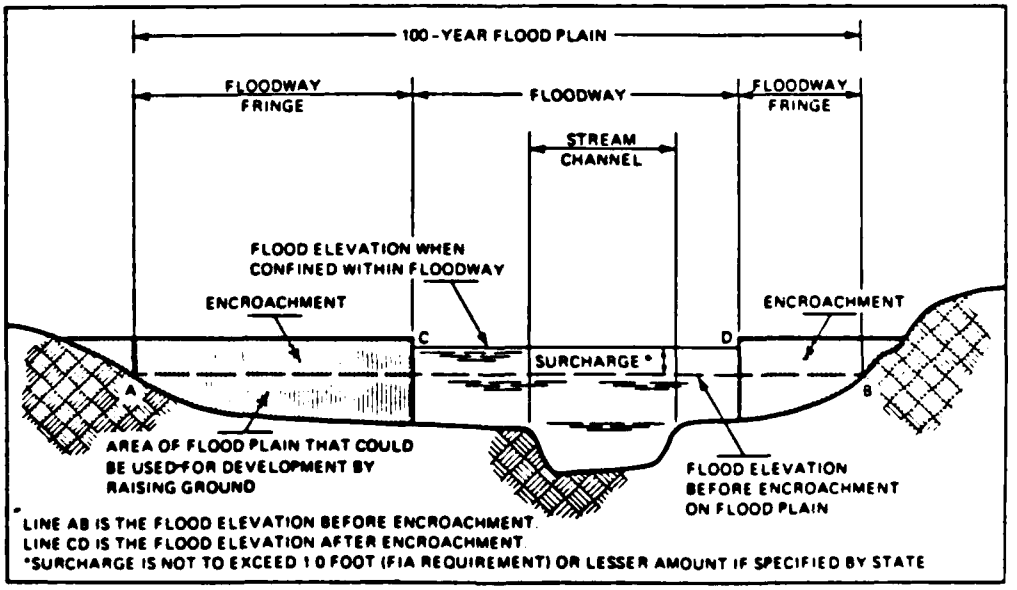

FIGURE 1 – FLOODWAY SCHEMATIC

c. Formulation of Flood Plain Regulations

Formulation of flood plain regulations in a simplified sense involves selecting the type and degree of control to be exercised for each specific flood plain. In principle, the form of the regulations is not as important as a maintained adequacy of control. The degree of control normally varies with the flood hazard as measured by depth of inundation, velocity of flow, frequency of flooding, and the need for available land. Considerable planning and research is required for the proper formulation of flood plain regulations. Where formulation of flood plain regulations is envisioned to require a lengthy period of time during which development is likely to occur, temporary regulations should be adopted to be amended later as necessary.

Modify Flooding

The traditional strategy of modifying floods through the construction of dams, dikes, levees and floodwalls, channel alterations, high flow diversions and spillways, and land treatment measures has repeatedly demonstrated its effectiveness for protecting property and saving lives, and it will continue to be a strategy of flood plain management. However, in the future, reliance solely upon a flood modification strategy is neither possible nor desirable. Although the large capital investment required by flood modifying tools has been provided largely by the Federal Government, sufficient funds from Federal sources have not been and are not likely to be available to meet all situations for which flood modifying measures would be both effective and economically feasible. Another consideration is that the cost of maintaining and operating flood control structures falls upon local governments except for major Federal reservoirs with flood control storage.

Flood modifications acting alone leave a residual flood loss potential and can encourage an unwarranted sense of security leading to inappropriate use of lands in the areas that are directly protected or in adjacent areas. For this reason, measures to modify possible floods should usually be accompanied by measures to modify the susceptibility to flood damage, particularly by land use regulations.

Flood modifying tools permit changes in the volume of runoff, in the peak stage of the flood, in the time of rise and duration, in the extent of the area flooded, in the velocity and depth of floodwaters, and consequently in the amount of debris, sediment, and pollutants that floods carry.

Modify the Impact of Flooding on Individuals and the Community

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in their preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, and purposeful transfer of some of the individual's loss to the community by reducing taxes on flood prone areas.

The distinction between a reasonable and unreasonable transfer of costs from the individual to the community can also be regulated and is a key to effective flood plain management.

CONCLUSION

This report presents local flood hazard information for the Maumee River in Henry County. The U.S. Army Corps of Engineers, Buffalo District, will provide interpretation and limited technical assistance in the application of the data contained in this report, particularly as to its use in developing effective flood plain regulations. Requests should be coordinated through the Ohio Department of Natural Resources, Division of Water. This office works closely with communities in establishing regulations related to the National Flood Insurance Program.

GLOSSARY

BACKWATER	The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.
BASE FLOOD	A flood which has an average return interval in the order of once in 100 years, although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed. It is commonly referred to as the "100-year flood."
DISCHARGE	The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).
FLOOD	An overflow of lands not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary and the lands are adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water. Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, and rise of groundwater coincident with increased streamflow.
FLOOD CREST	The maximum stage or elevation reached by floodwaters at a given location.
FLOOD FREQUENCY	A statistical expression of the percent chance of exceeding a discharge of a given magnitude in any given year. For example, a 100-year flood has a magnitude expected to be exceeded on the average of once every hundred years. Such a flood has a 1 percent chance of being exceeded in any given year. Often used interchangeably with RECURRENCE INTERVAL.
FLOOD PLAIN	The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

FLOOD PROFILE	A graph showing the relationship of water surface elevation to location; the latter generally expressed as distance upstream from a known point along the approximate centerline of a stream of water that flows in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.
FLOOD STAGE	The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.
FLOODWAY	The channel of a watercourse and those portions of the adjoining flood plain required to provide for the passage of the selected flood (normally the 100-year flood) with an insignificant increase in the flood levels above that of natural conditions. As used in the National Flood Insurance Program, floodways must be large enough to pass the 100-year flood without causing an increase in elevation of more than a specified amount (1 foot in most areas).
RECURRENCE INTERVAL	A statistical expression of the average time between floods exceeding a given magnitude (see FLOOD FREQUENCY).

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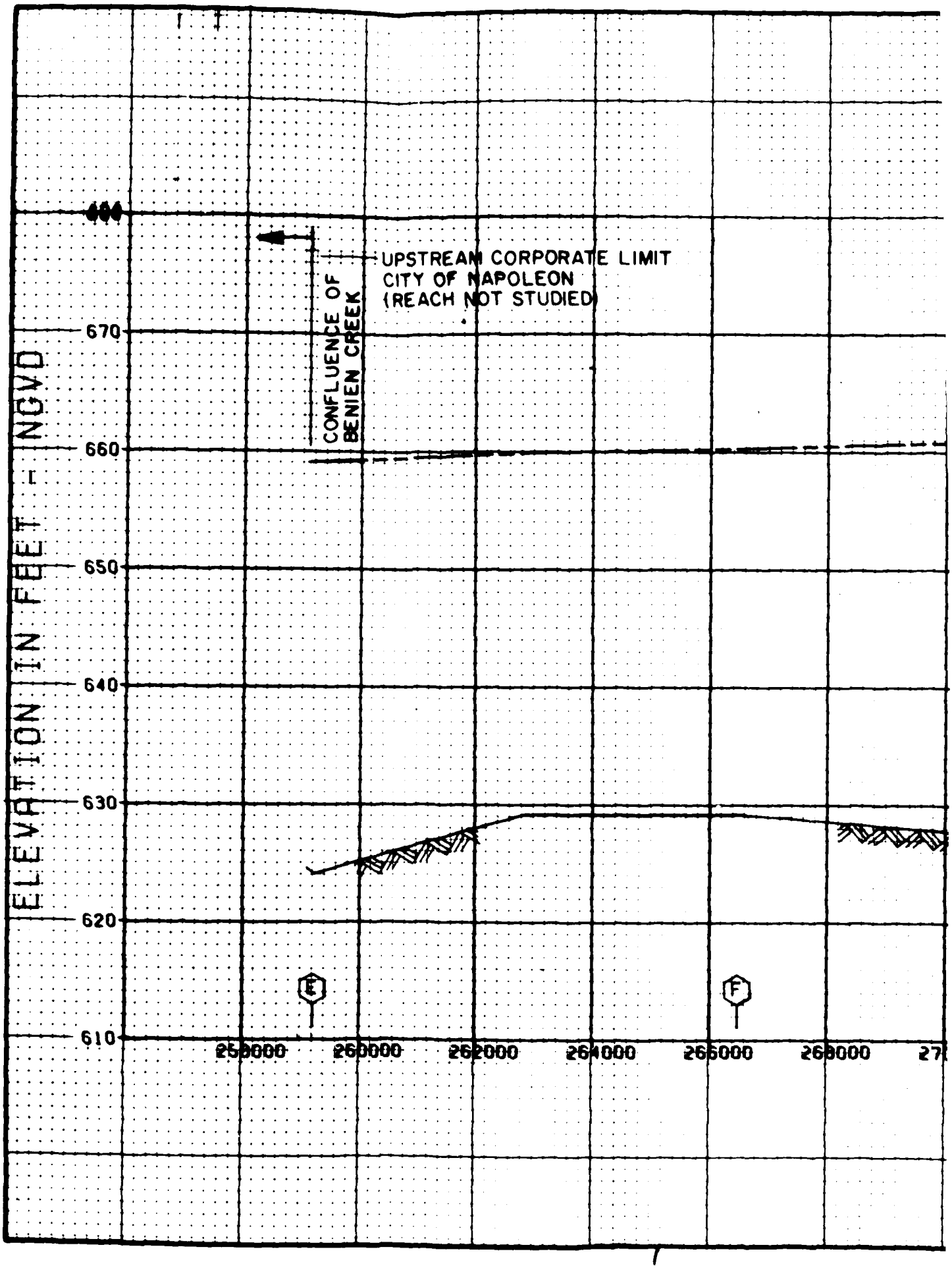
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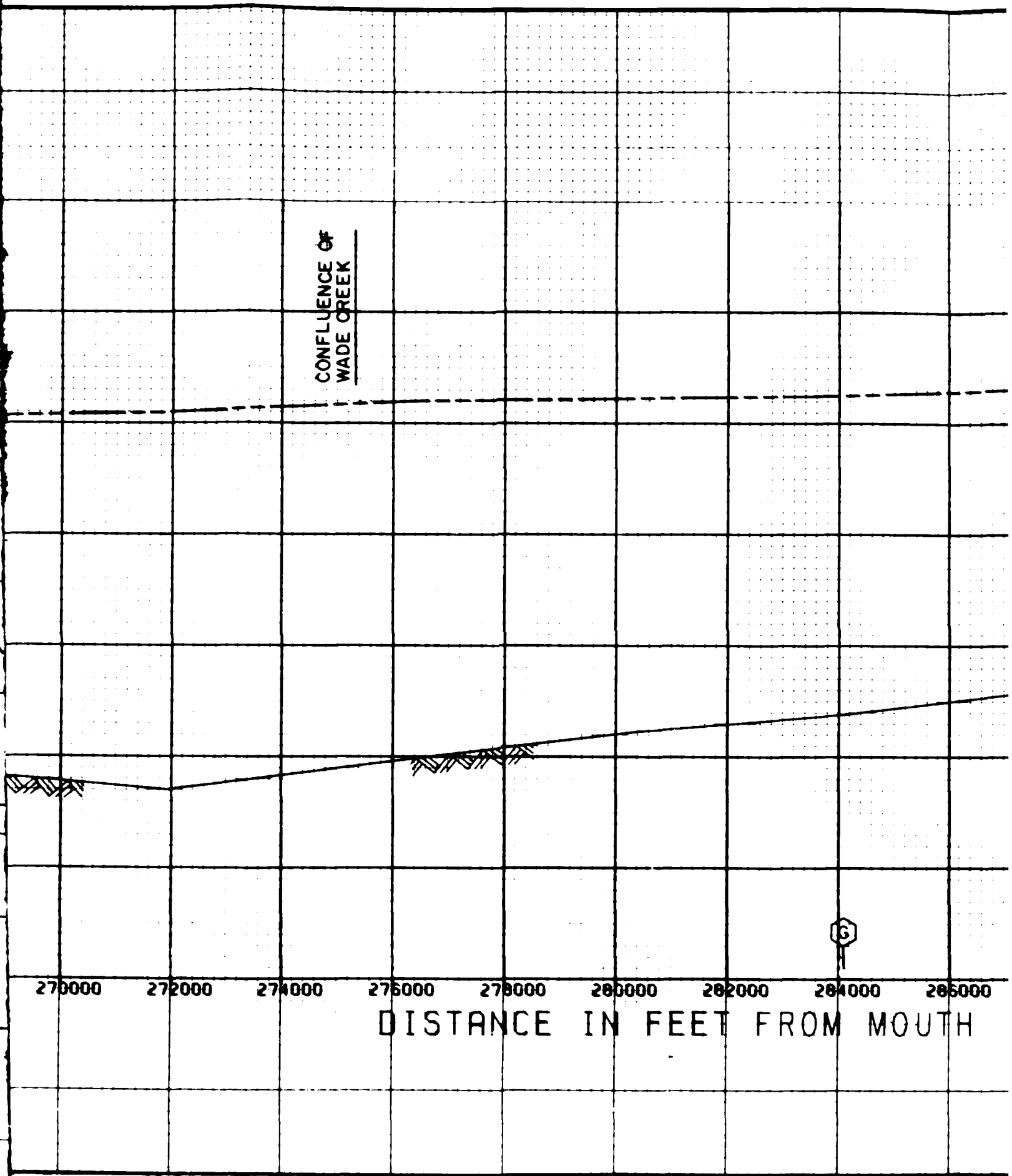
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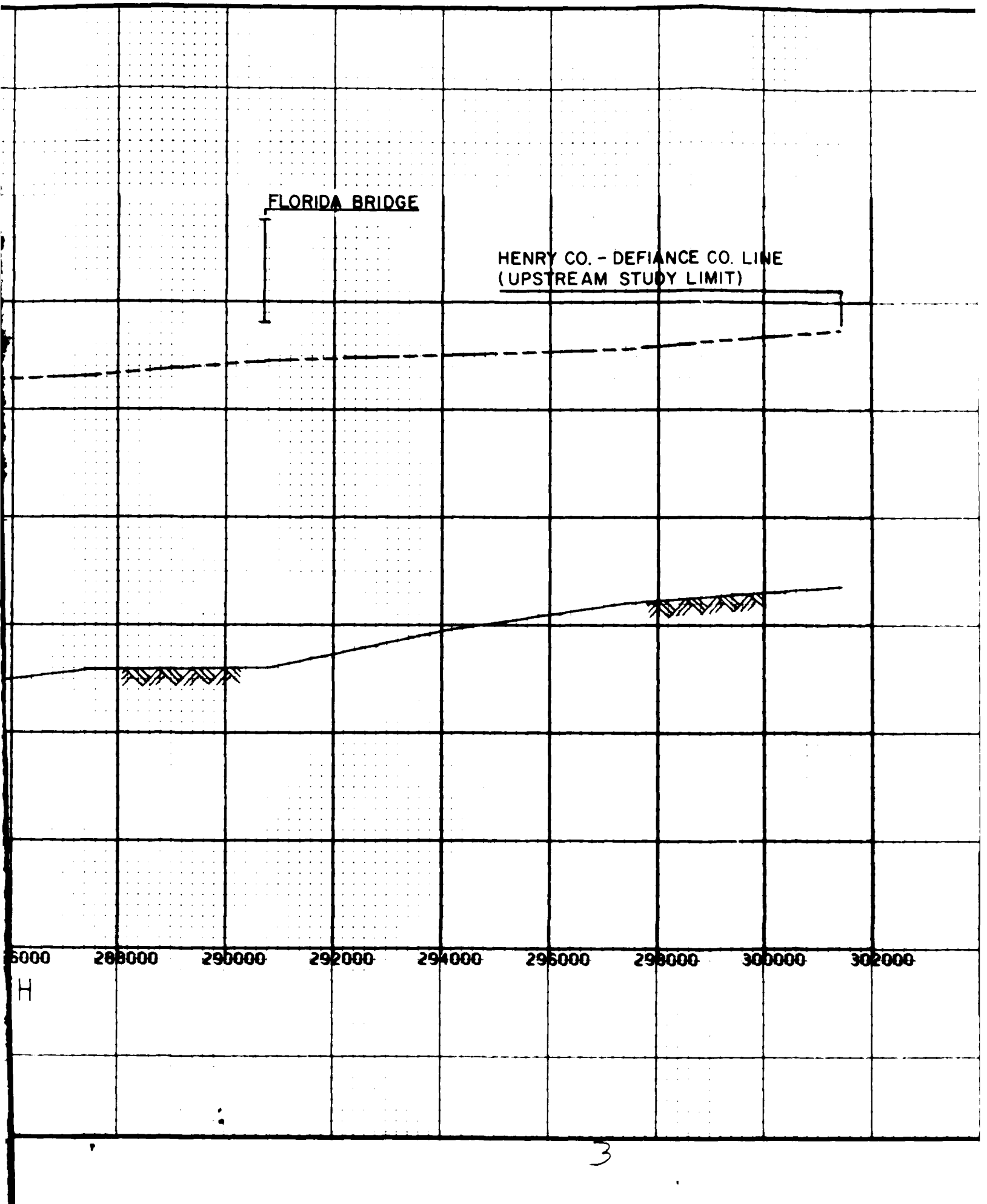
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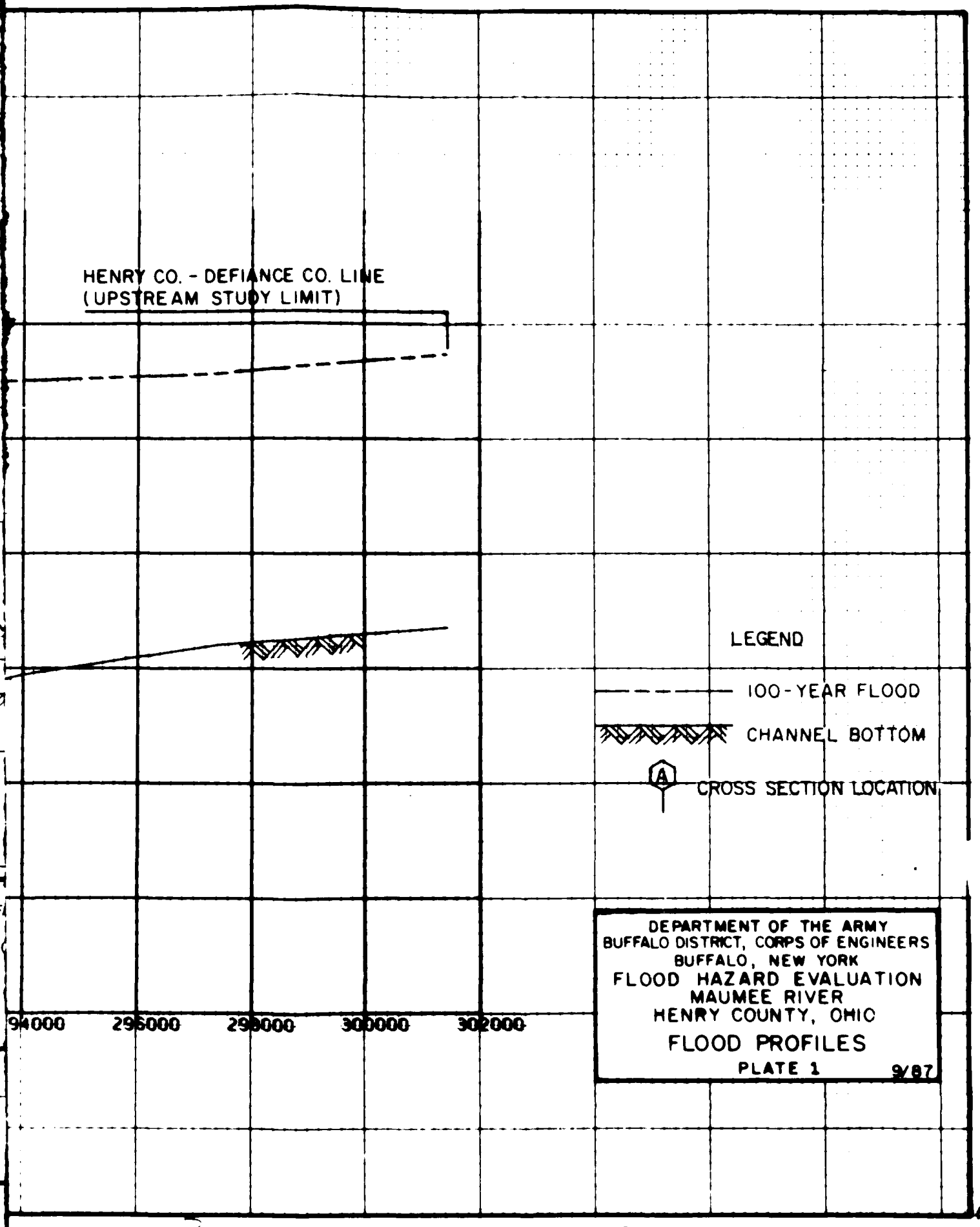
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DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK
FLOOD HAZARD EVALUATION
MAUMEE RIVER
HENRY COUNTY, OHIO
FLOOD PROFILES
PLATE 1
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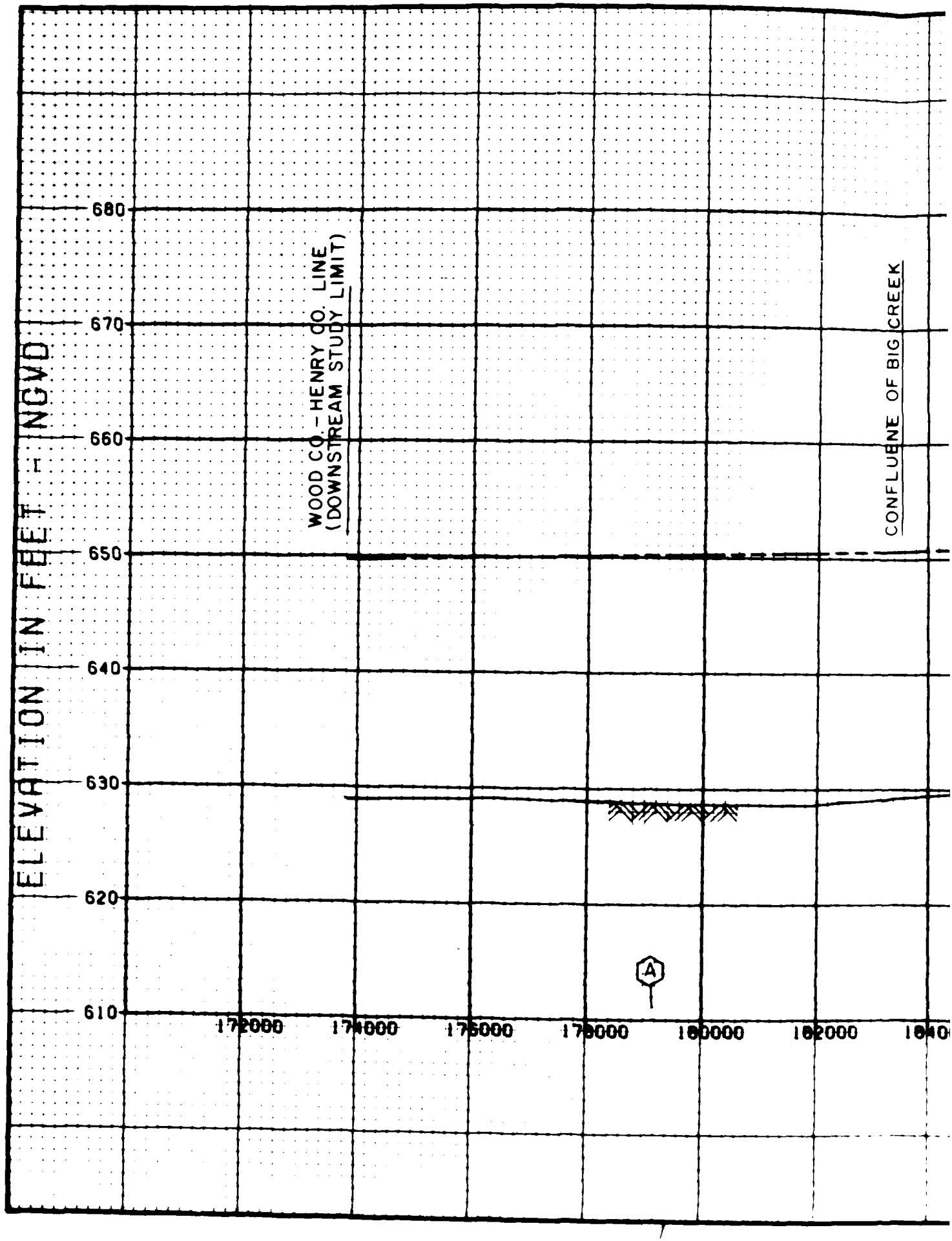
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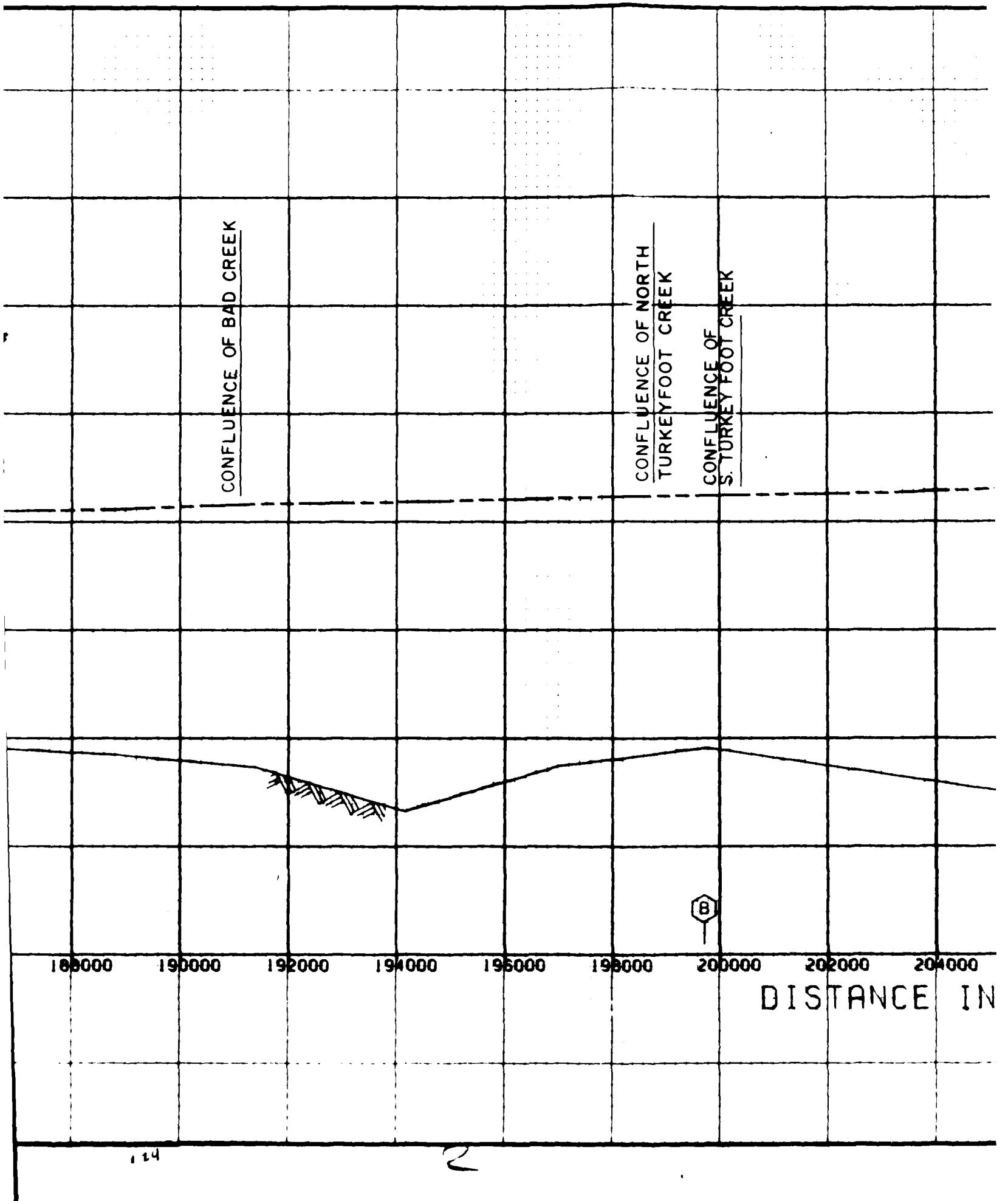
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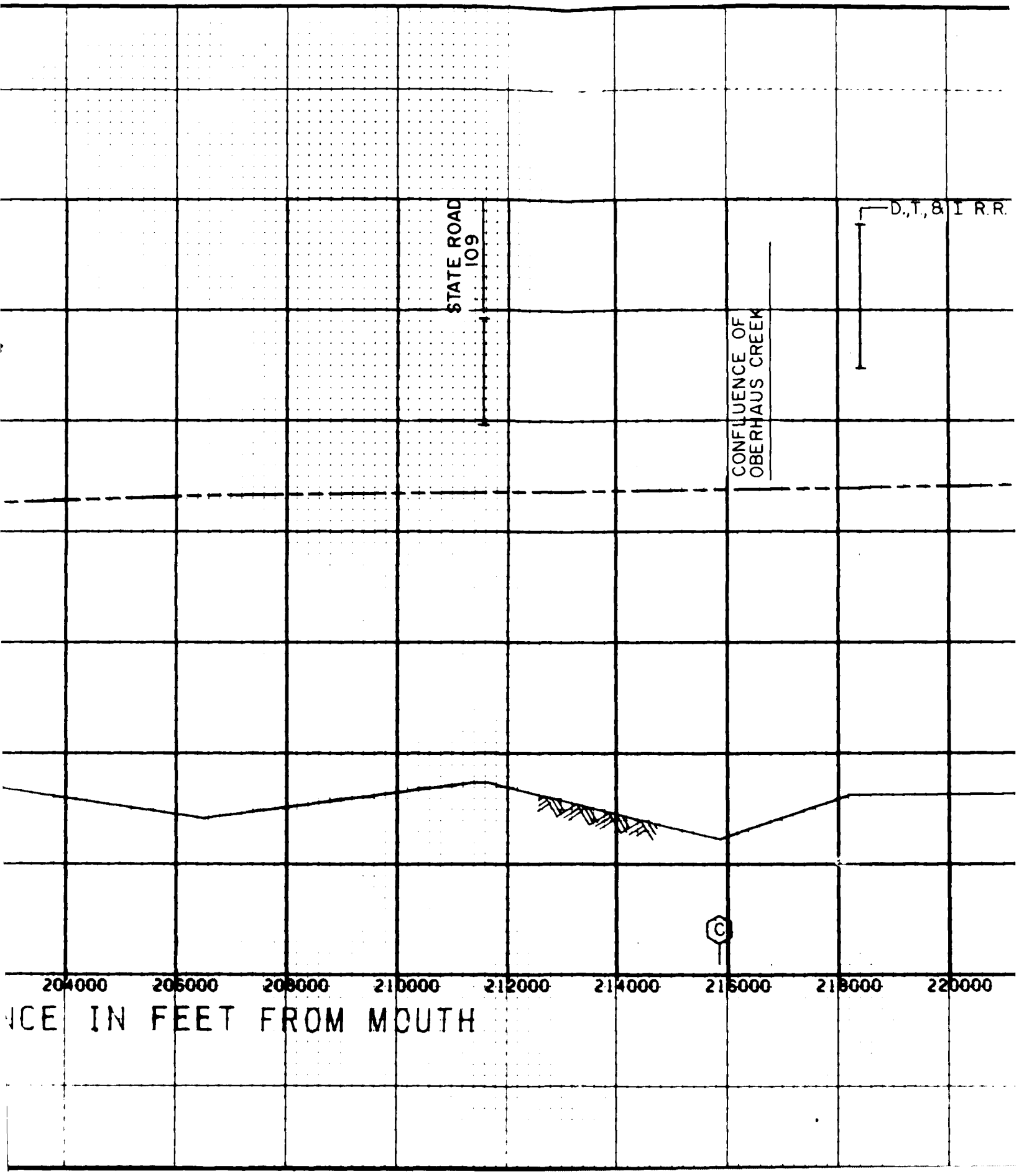
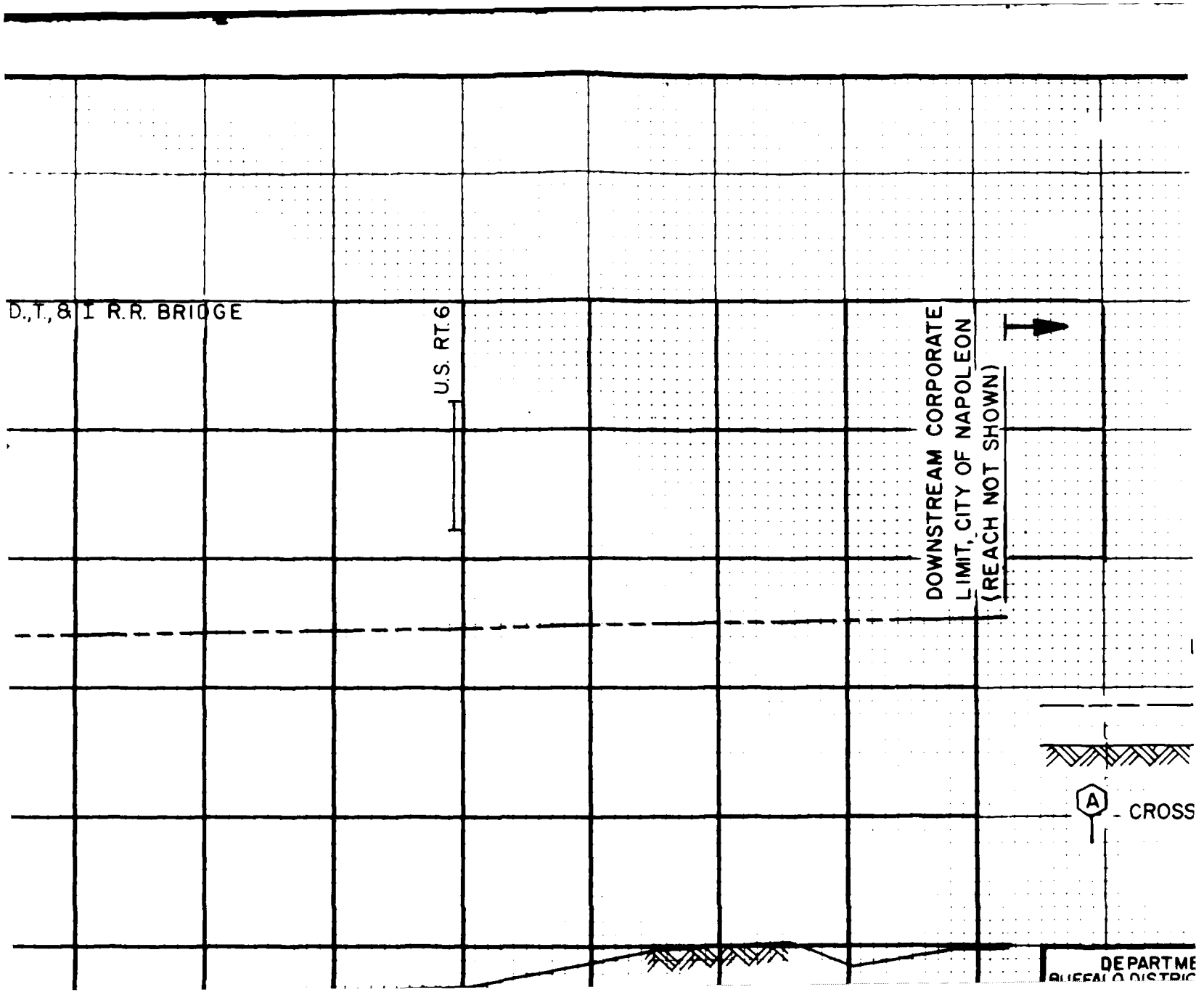
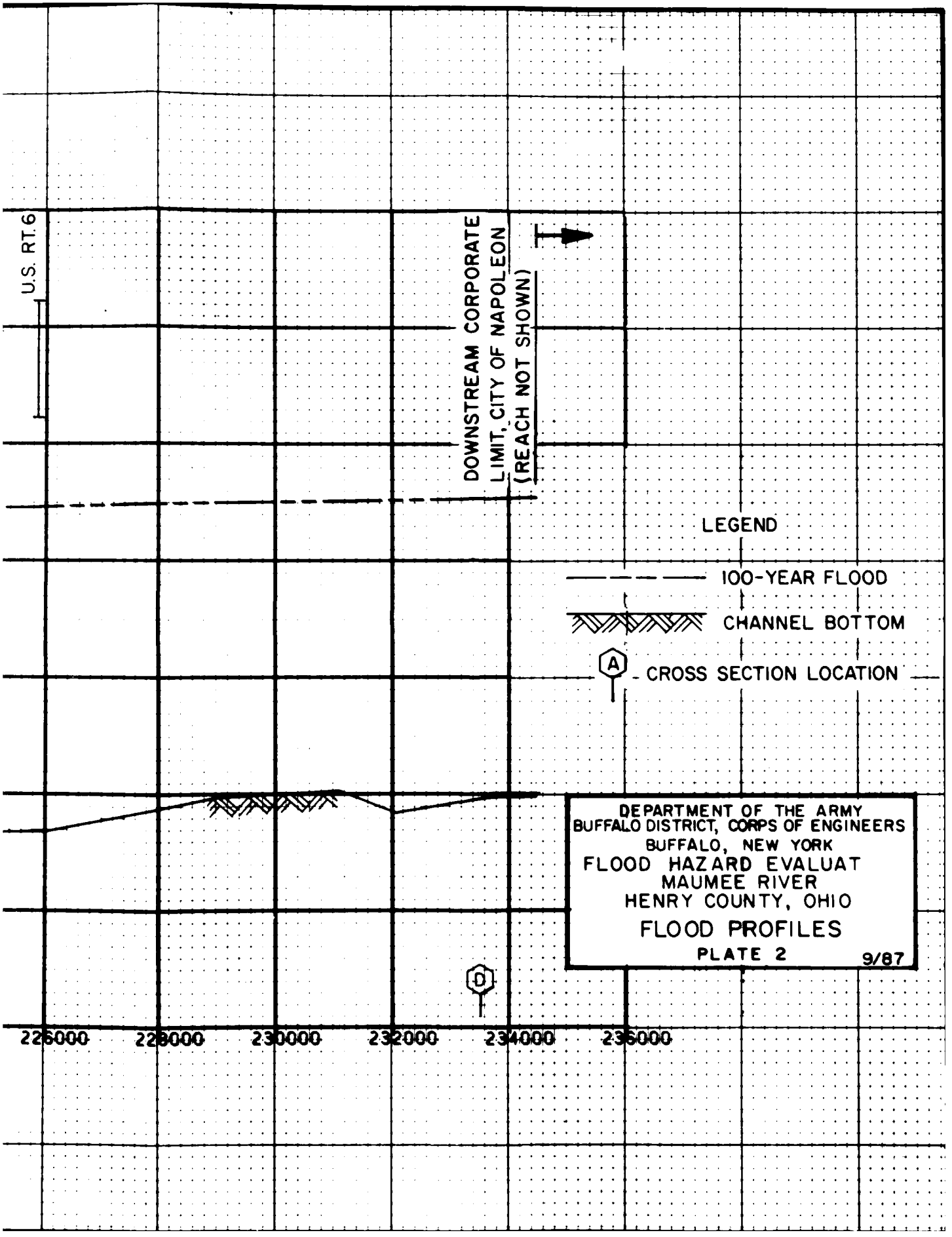
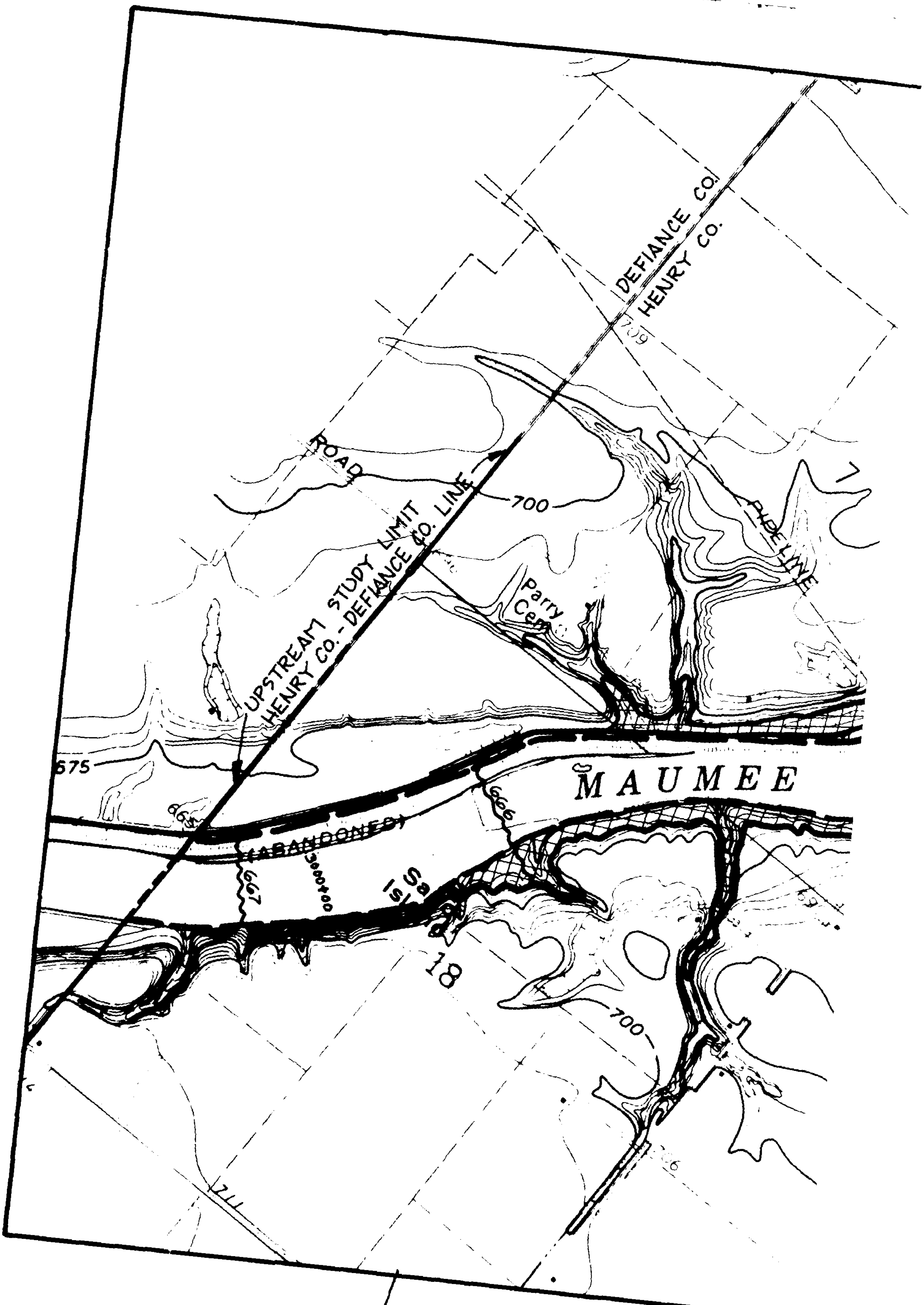
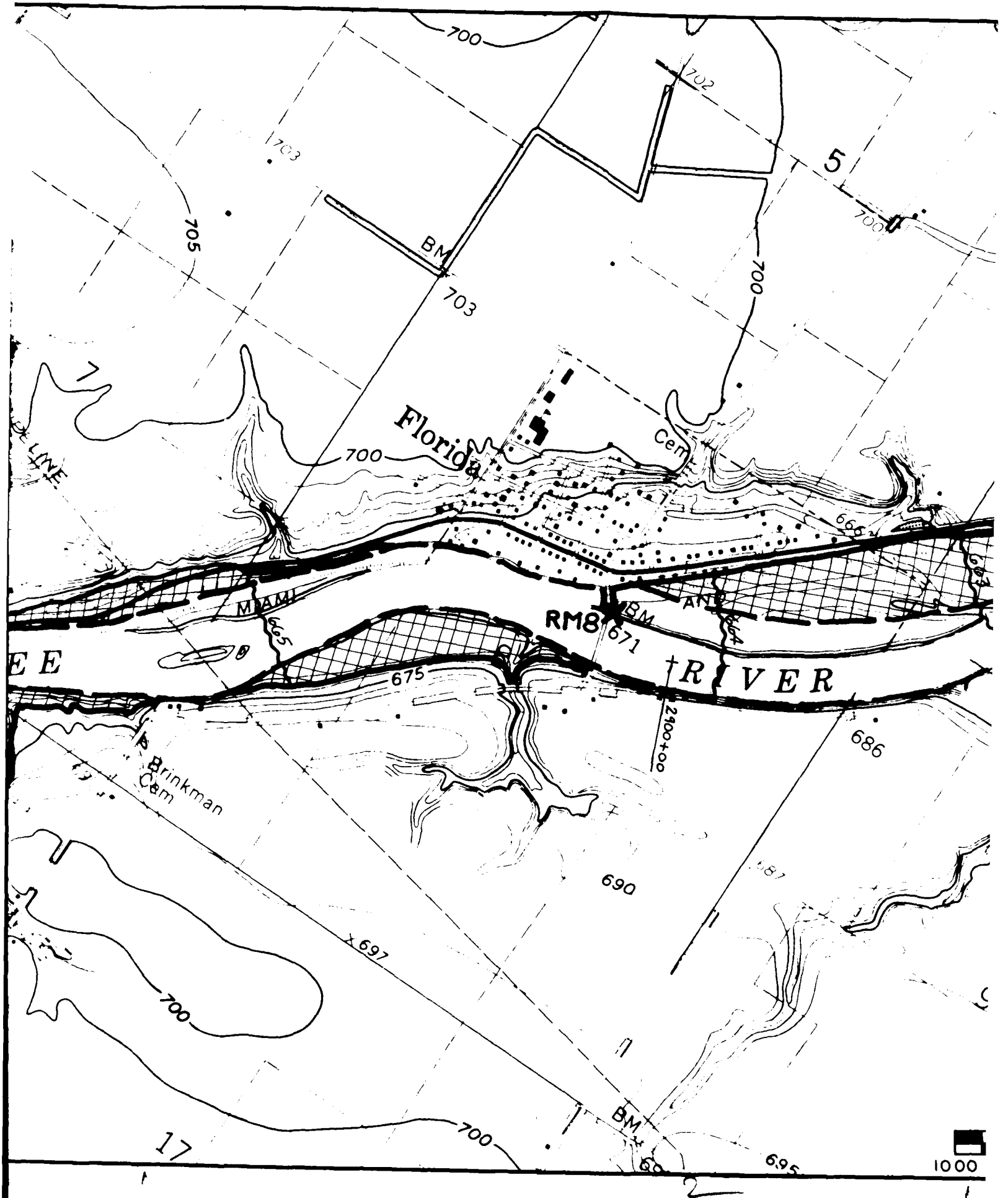
204000
DISTANCE IN

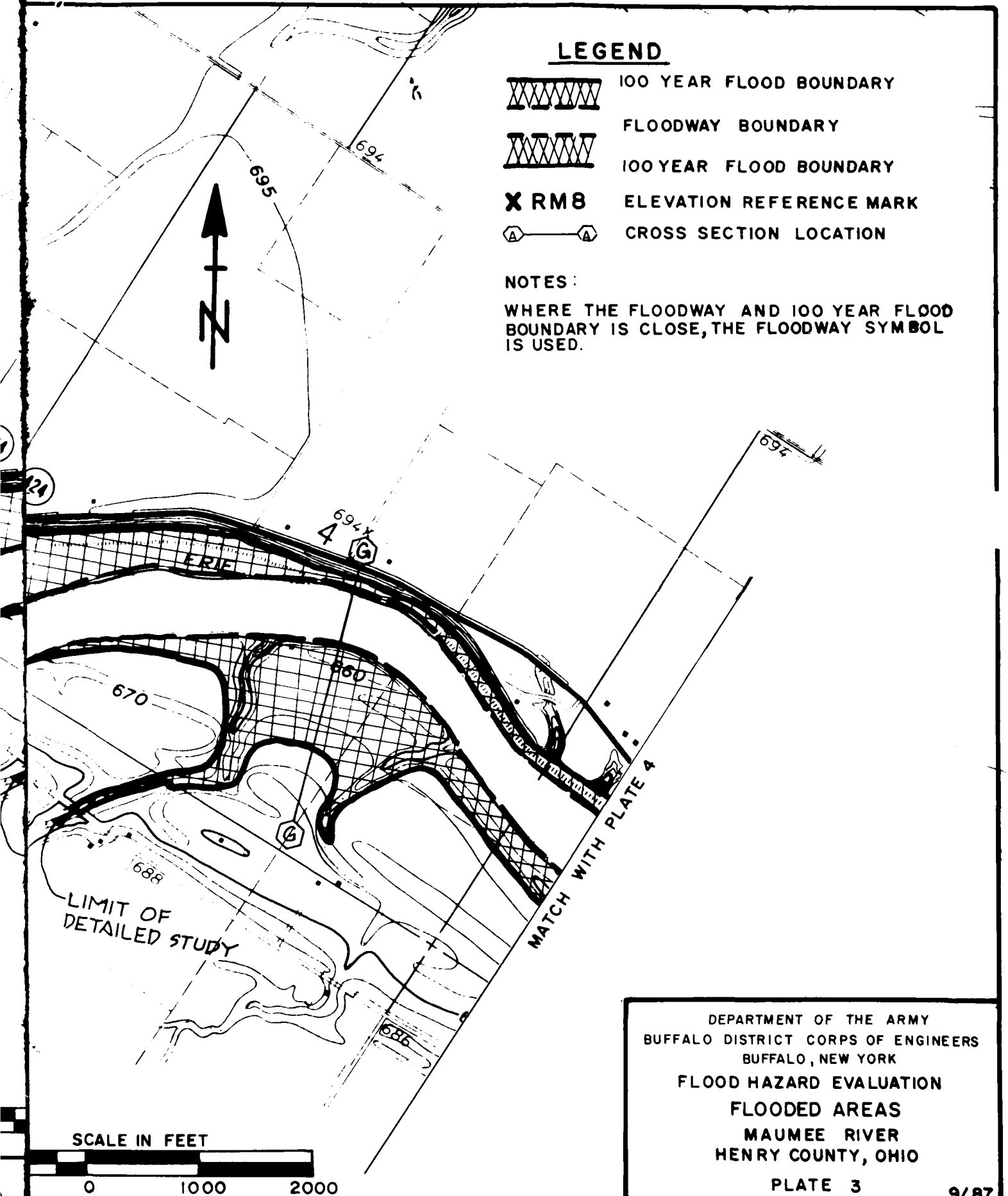

STATE ROAD 109
CONFLUENCE OF OBERHAUS CREEK
D.,T.,& I R.R.
C
204000
206000
208000
210000
212000
214000
216000
218000
220000
NCE IN FEET FROM MOUTH


D.,T.,& I R.R. BRIDGE
U.S. RT.6
DOWNSTREAM CORPORATE
LIMIT, CITY OF NAPOLEON
(REACH NOT SHOWN)
A
CROSS
DEPARTME


U.S. RT.6
DOWNSTREAM CORPORATE LIMIT, CITY OF NAPOLEON (REACH NOT SHOWN)
LEGEND
100-YEAR FLOOD
CHANNEL BOTTOM
A
CROSS SECTION LOCATION
D
226000
228000
230000
232000
234000
236000
DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
BUFFALO, NEW YORK
FLOOD HAZARD EVALUAT
MAUMEE RIVER
HENRY COUNTY, OHIO
FLOOD PROFILES
PLATE 2
9/87


DEFIANCE CO.
HENRY CO.
ROAD
700
PIPE LINE
UPSTREAM STUDY LIMIT
HENRY CO.-DEFIANCE CO. LINE
Parry Cem.
675
665
666
(ABANDONED)
667
MAUMEE
18
700


700
702
703
5
705
BM
703
700
7
Florida
Cem
LINE
700
666
MIAMI
RM8
BM
671
665
675
RIVER
2900+00
686
Brinkman
Cem
690
697
700
17
BM
695
1000



DEPARTMENT OF THE ARMY
BUFFALO DISTRICT CORPS OF ENGINEERS
BUFFALO, NEW YORK

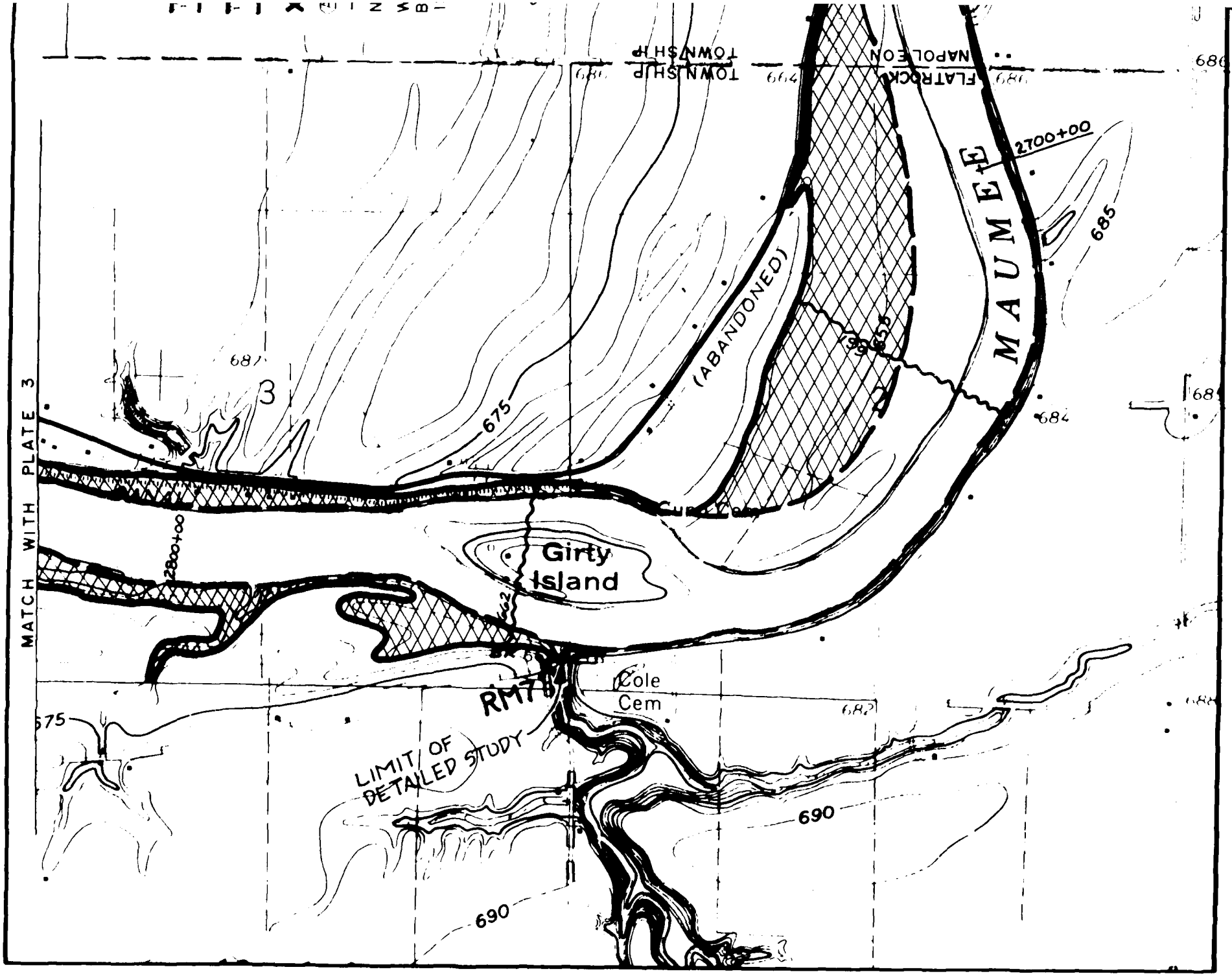
FLOOD HAZARD EVALUATION

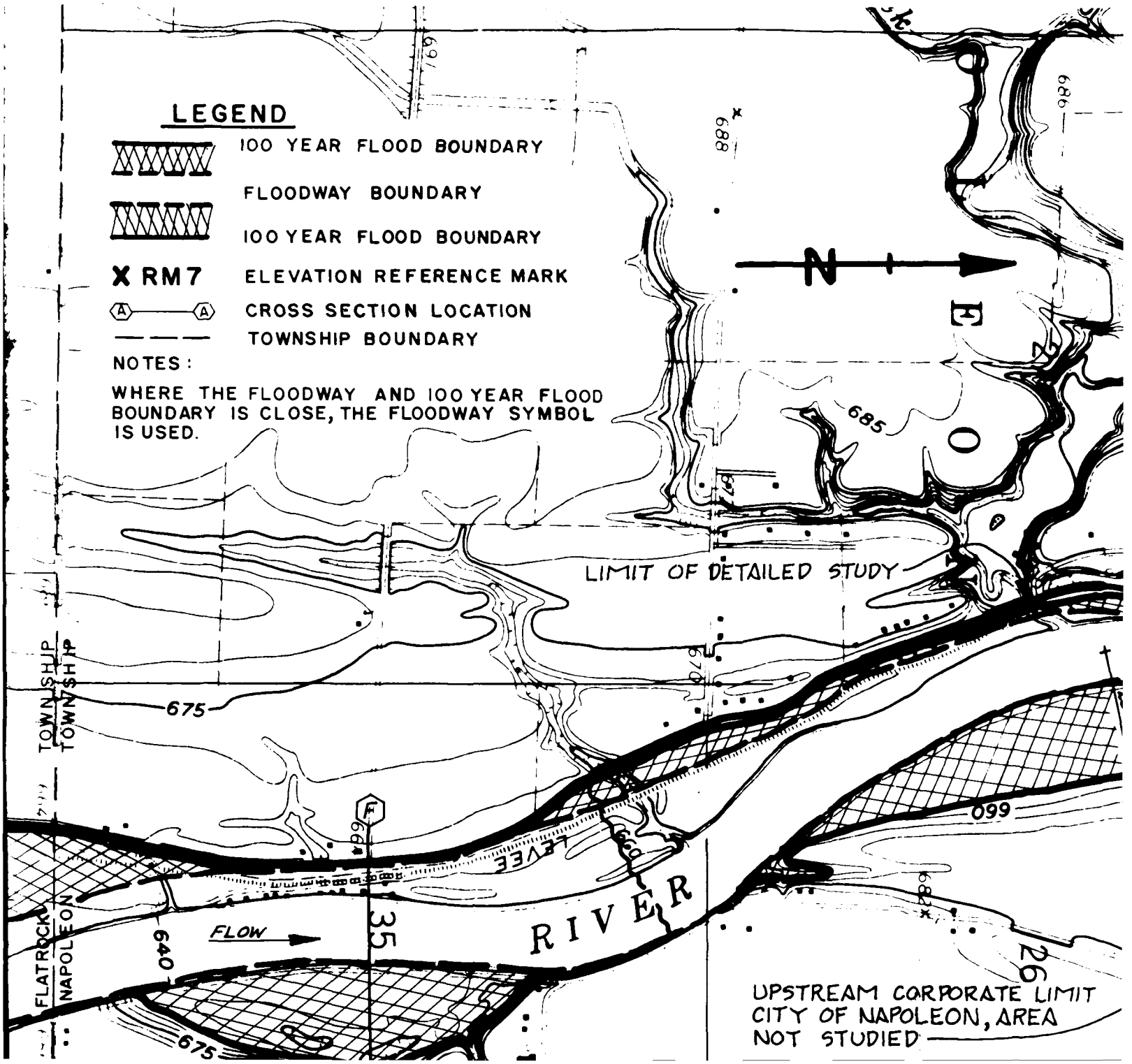
FLOODED AREAS

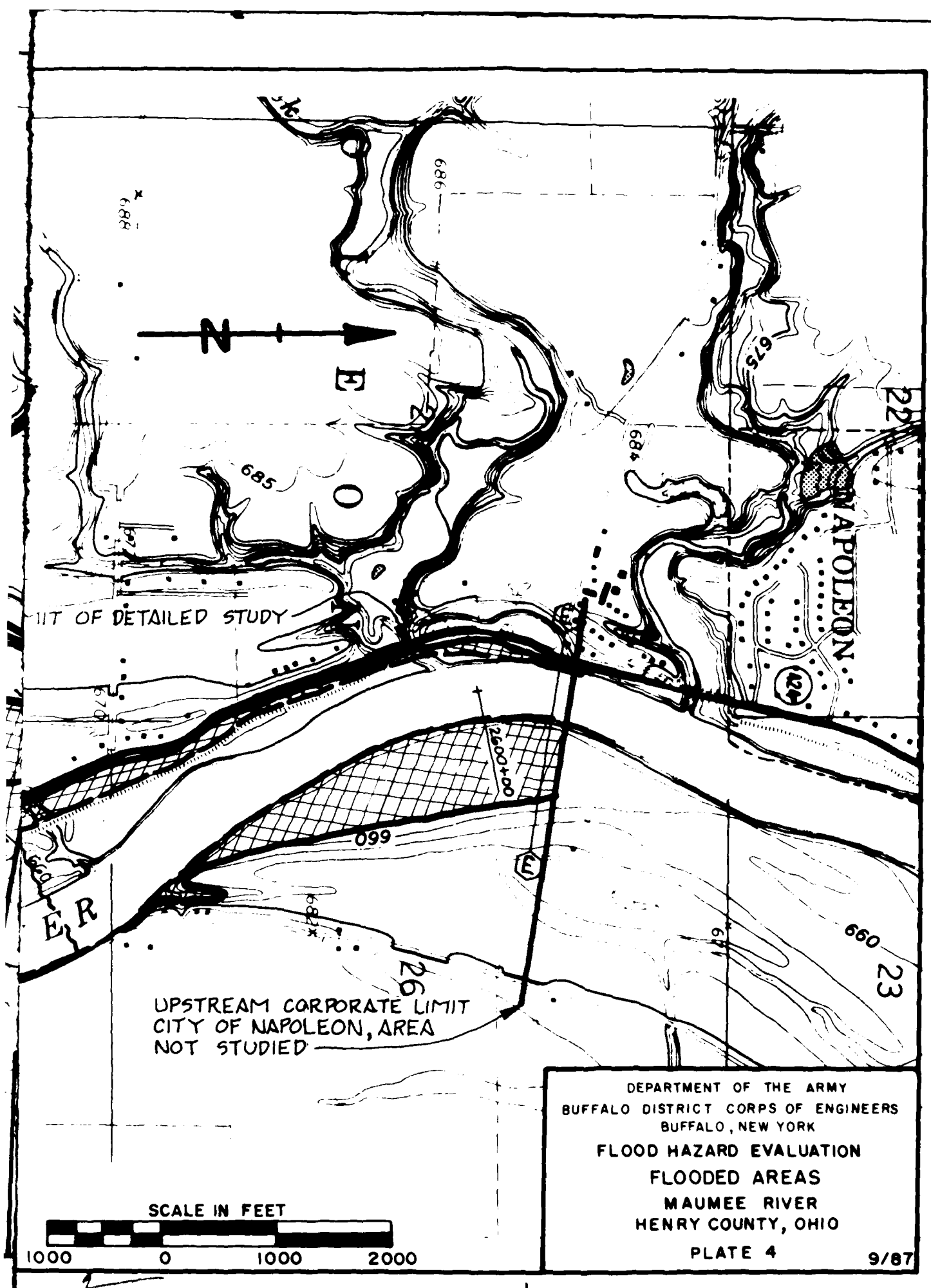
MAUMEE RIVER
HENRY COUNTY, OHIO

PLATE 3

9/87


MATCH WITH PLATE 3
TOWNSHIP
TOWNSHIP
NAPOLEON
FLATROCK
MAUMEE
2700+00
2800+00
685
684
675
(ABANDONED)
Girty Island
RMT6
Cole Cem
LIMIT OF DETAILED STUDY
690
690


LEGEND
100 YEAR FLOOD BOUNDARY
FLOODWAY BOUNDARY
100 YEAR FLOOD BOUNDARY
X RM7 ELEVATION REFERENCE MARK
CROSS SECTION LOCATION
TOWNSHIP BOUNDARY
NOTES:
WHERE THE FLOODWAY AND 100 YEAR FLOOD BOUNDARY IS CLOSE, THE FLOODWAY SYMBOL IS USED.
N
LIMIT OF DETAILED STUDY
TOWNSHIP
TOWNSHIP
FLATROCK
NAPOLEON
675
640
FLOW
LEVEE
RIVER
099
UPSTREAM CORPORATE LIMIT
CITY OF NAPOLEON, AREA
NOT STUDIED



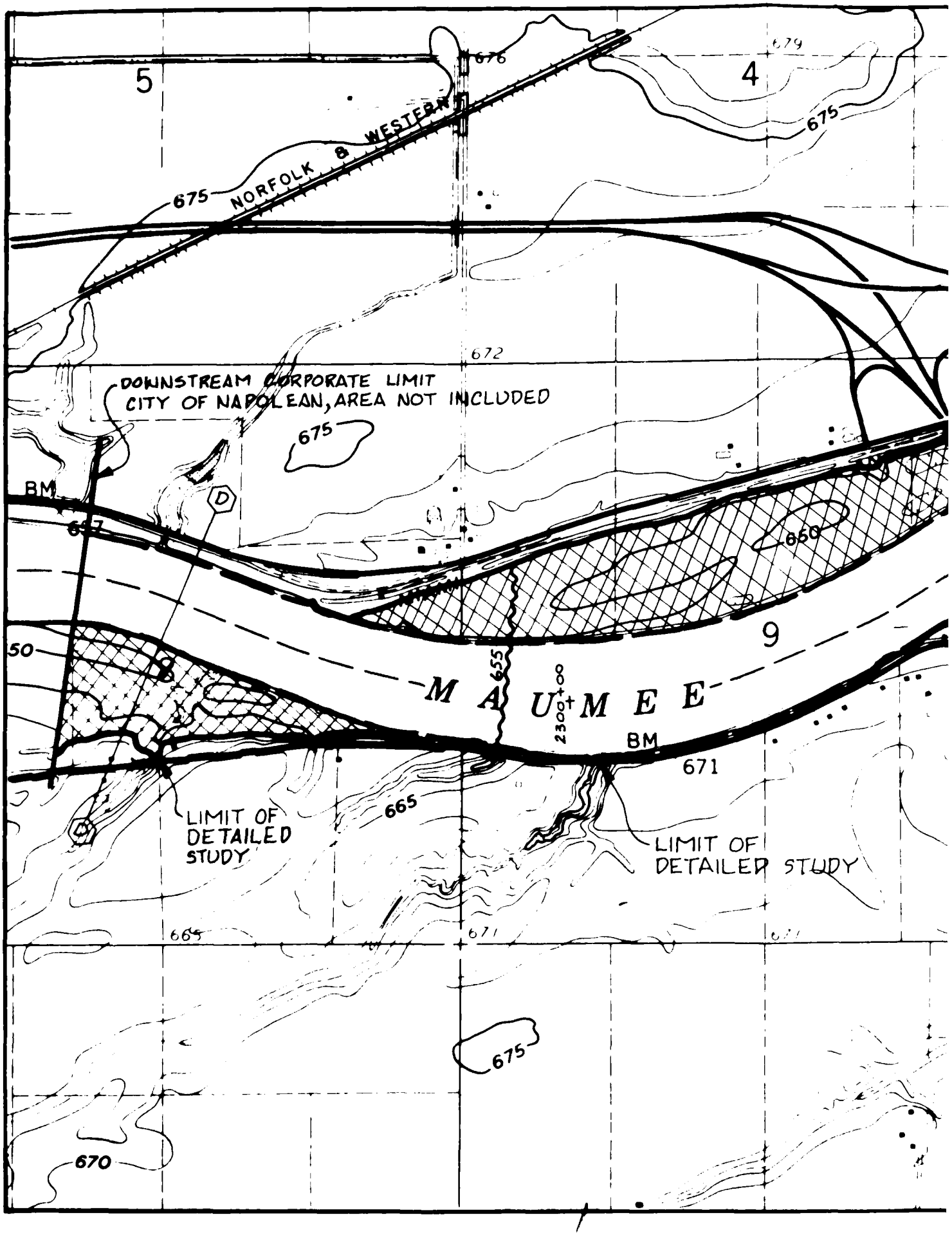
DEPARTMENT OF THE ARMY
BUFFALO DISTRICT CORPS OF ENGINEERS
BUFFALO, NEW YORK

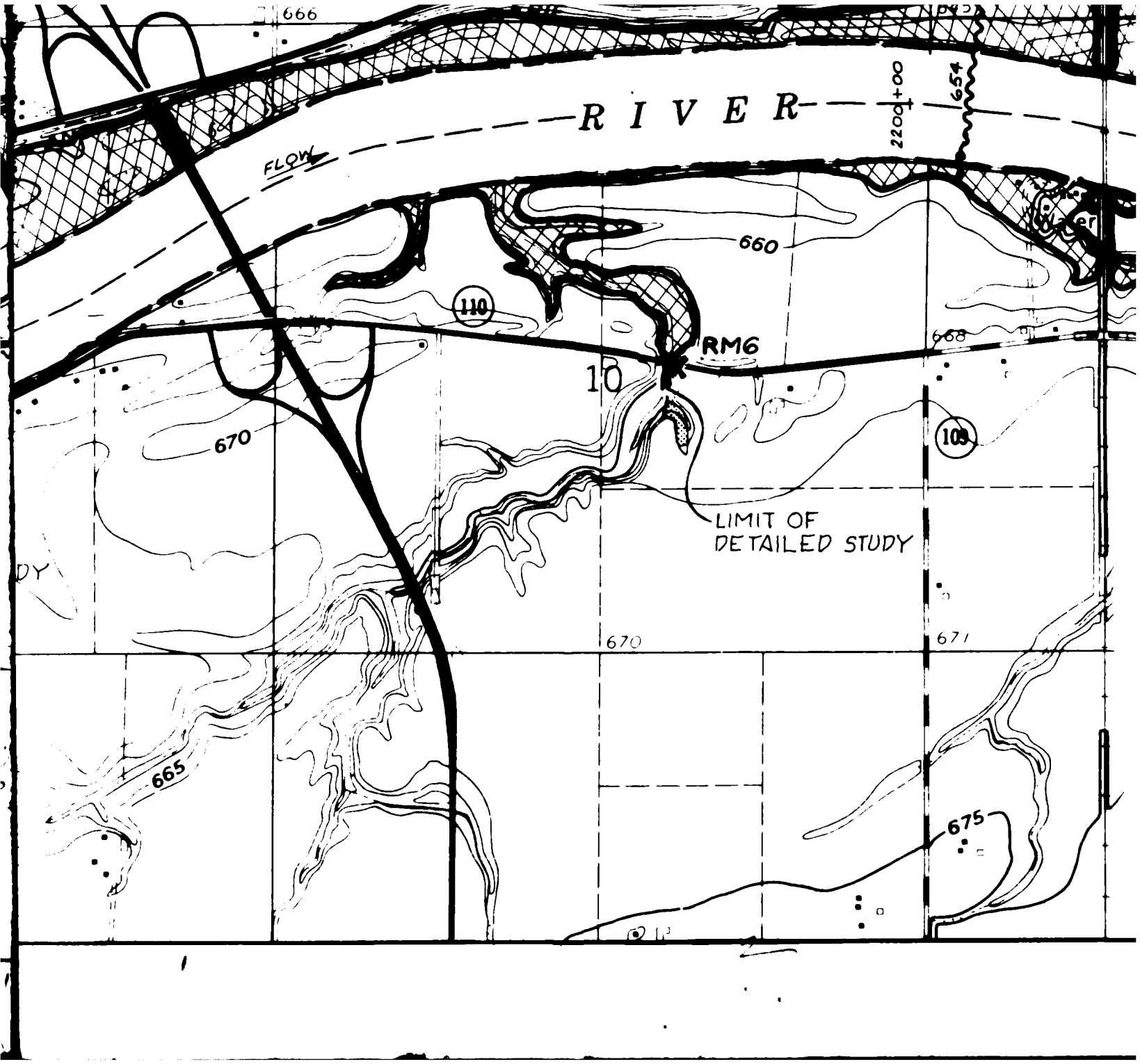
FLOOD HAZARD EVALUATION

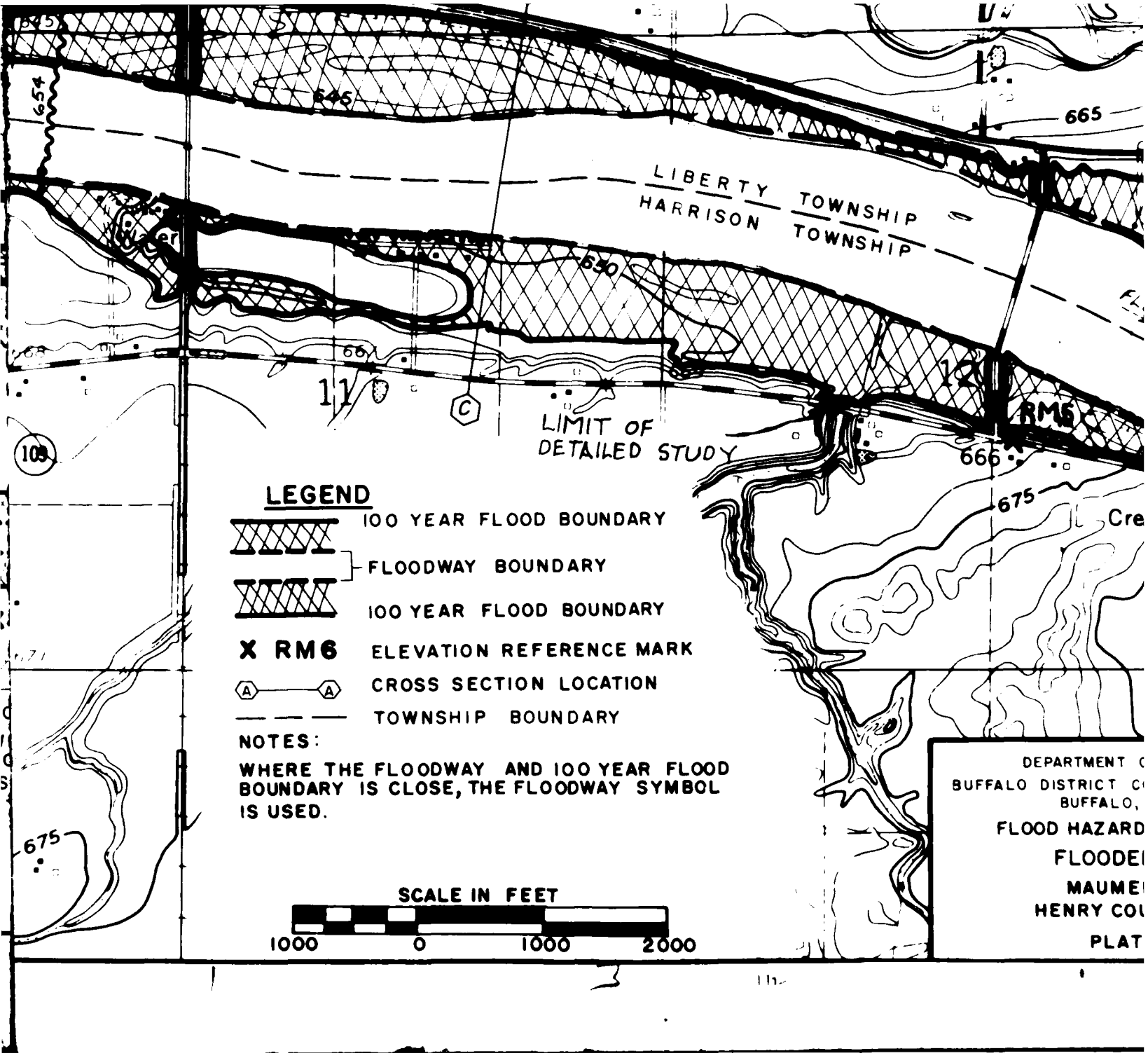
FLOODED AREAS

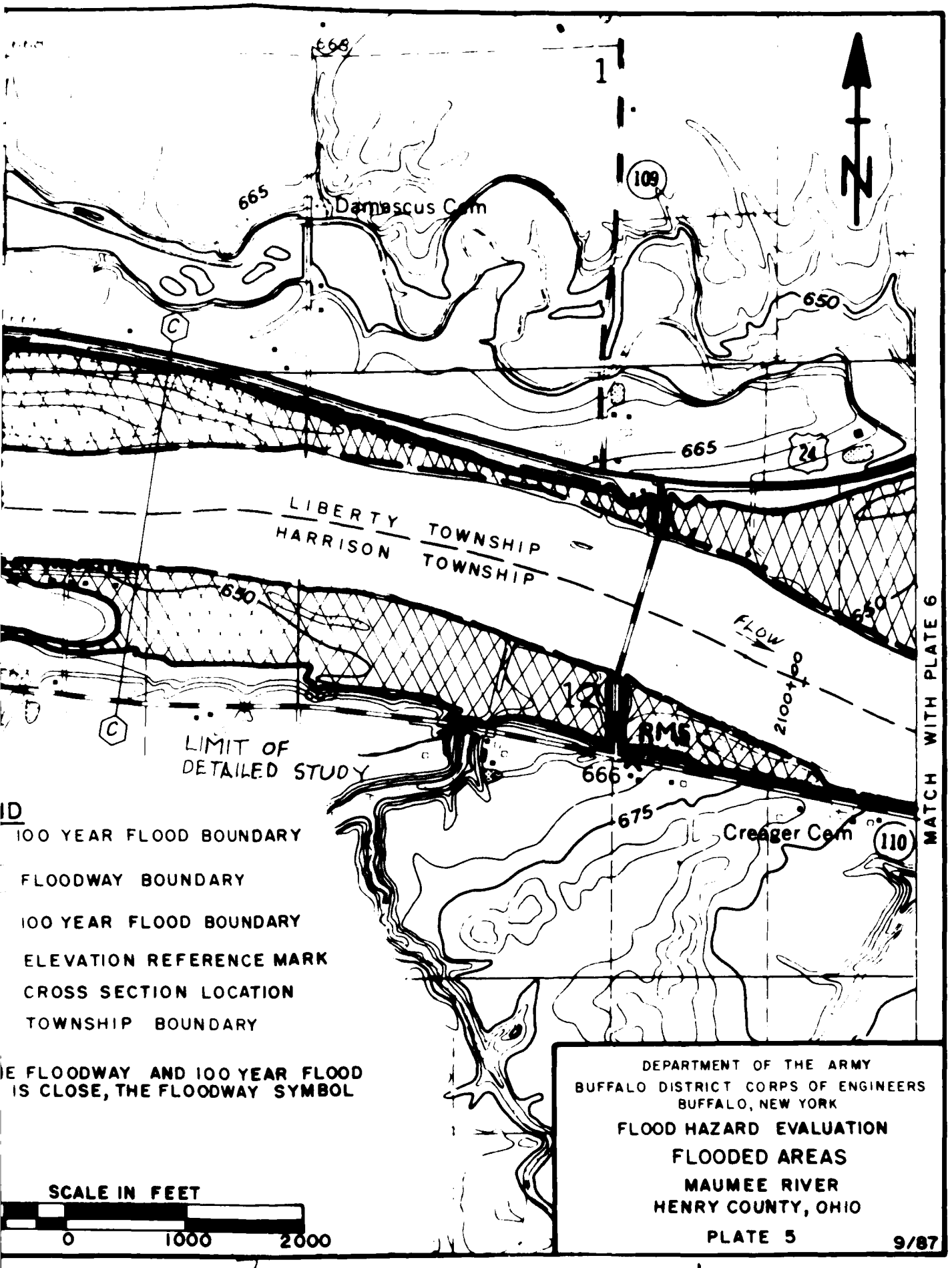
MAUMEE RIVER
HENRY COUNTY, OHIO

PLATE 4 9/87


5
4
676
679
675
NORFOLK & WESTERN
675
672
DOWNSTREAM CORPORATE LIMIT
CITY OF NAPOLEAN, AREA NOT INCLUDED
675
BM
667
D
660
50
9
655
MAUMEE
2300+
BM
671
665
LIMIT OF
DETAILED
STUDY
LIMIT OF
DETAILED STUDY
665
671
675
670


666
RIVER
FLOW
220+00
654
660
110
RM6
668
10
670
LIMIT OF
DETAILED STUDY
671
665
675


645
654
665
LIBERTY TOWNSHIP
HARRISON TOWNSHIP
650
660
1170
C
LIMIT OF
DETAILED STUDY
RM6
666
675
LEGEND
100 YEAR FLOOD BOUNDARY
FLOODWAY BOUNDARY
100 YEAR FLOOD BOUNDARY
X RM6 ELEVATION REFERENCE MARK
A A CROSS SECTION LOCATION
TOWNSHIP BOUNDARY
NOTES:
WHERE THE FLOODWAY AND 100 YEAR FLOOD BOUNDARY IS CLOSE, THE FLOODWAY SYMBOL IS USED.
SCALE IN FEET
1000 0 1000 2000
DEPARTMENT
BUFFALO DISTRICT
BUFFALO,
FLOOD HAZARD
FLOODE
MAUME
HENRY CO
PLAT



ID

100 YEAR FLOOD BOUNDARY

FLOODWAY BOUNDARY

100 YEAR FLOOD BOUNDARY

ELEVATION REFERENCE MARK

CROSS SECTION LOCATION

TOWNSHIP BOUNDARY

E FLOODWAY AND 100 YEAR FLOOD
IS CLOSE, THE FLOODWAY SYMBOL

SCALE IN FEET

0 1000 2000

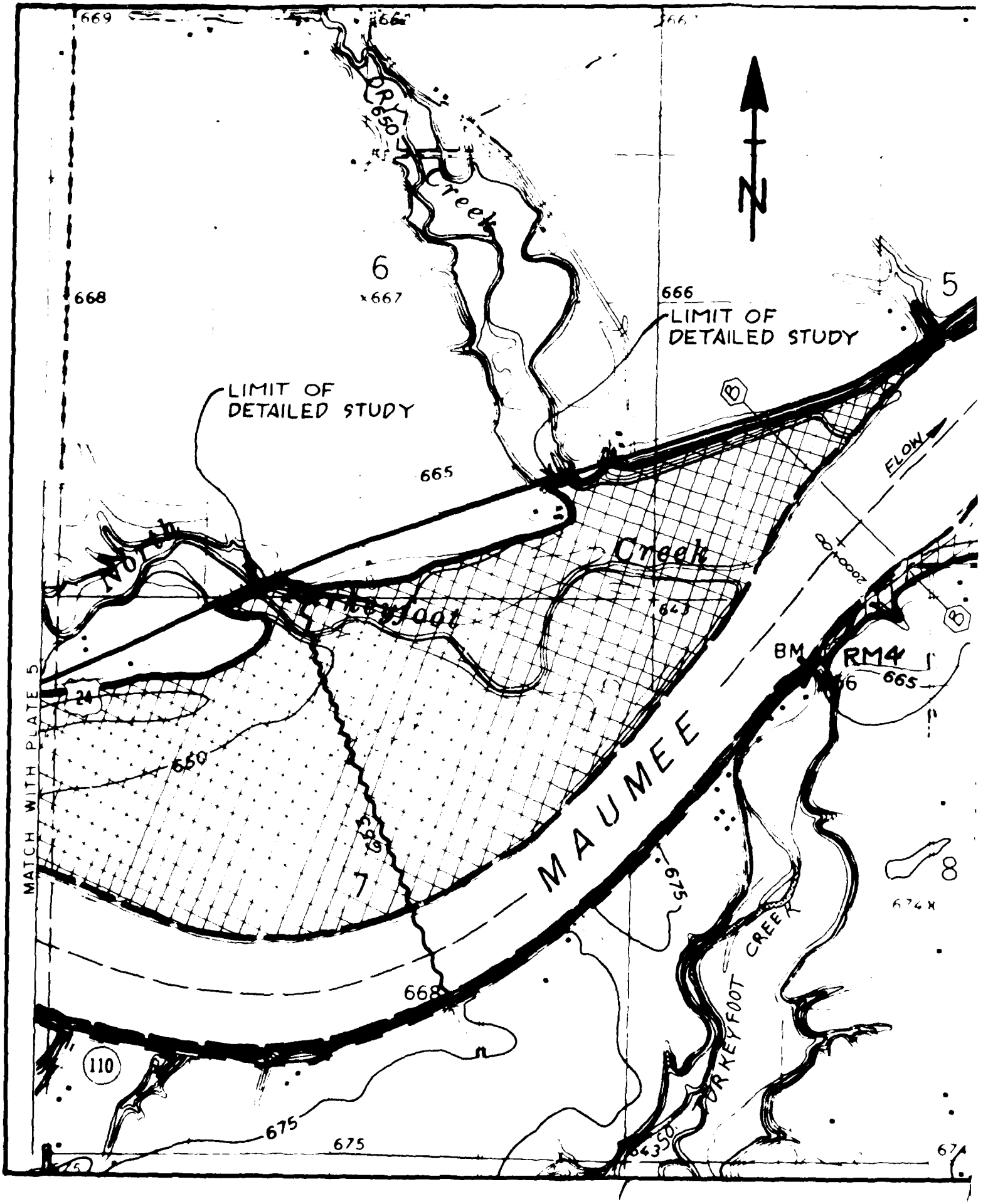
DEPARTMENT OF THE ARMY
BUFFALO DISTRICT CORPS OF ENGINEERS
BUFFALO, NEW YORK

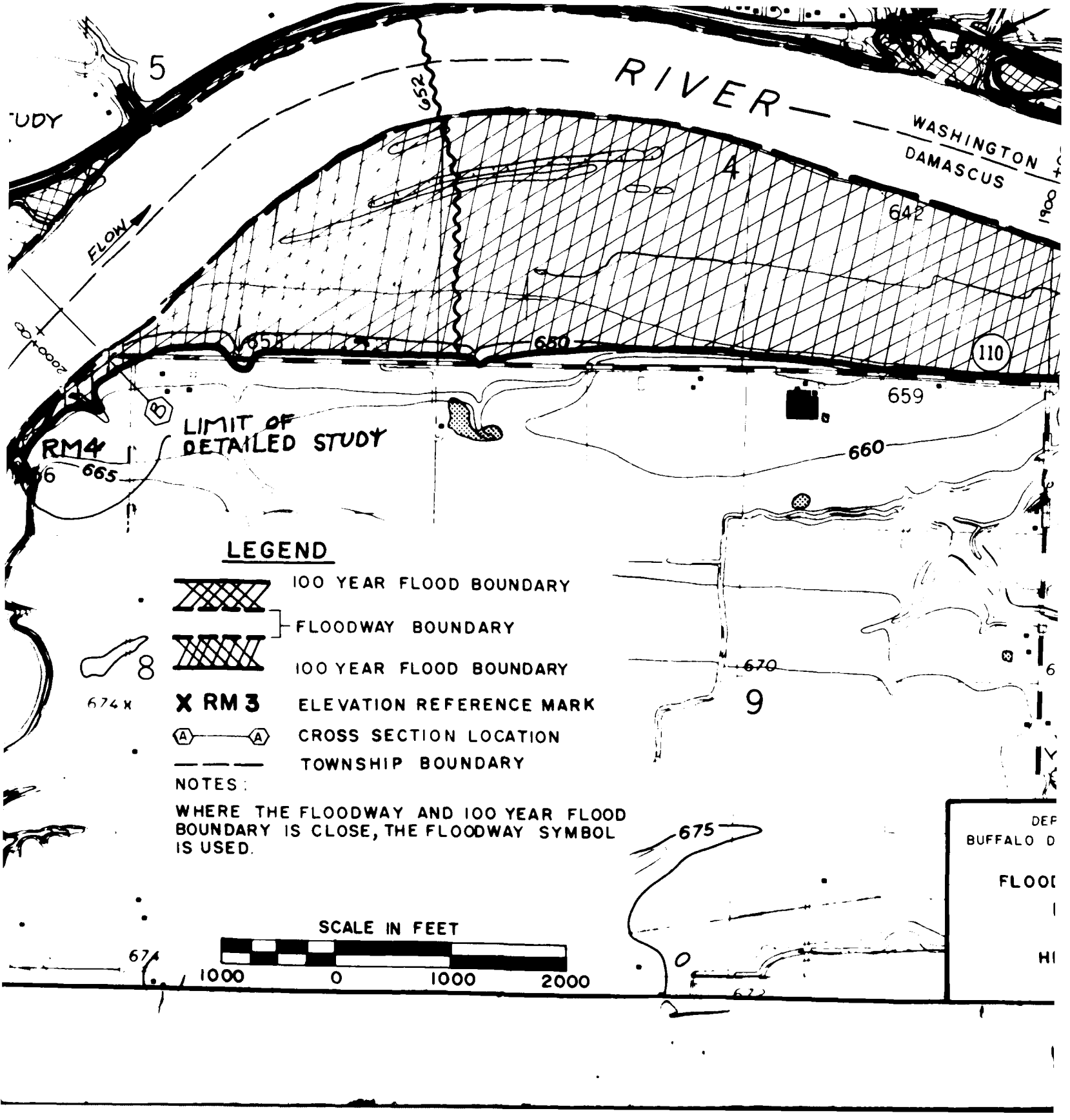
FLOOD HAZARD EVALUATION

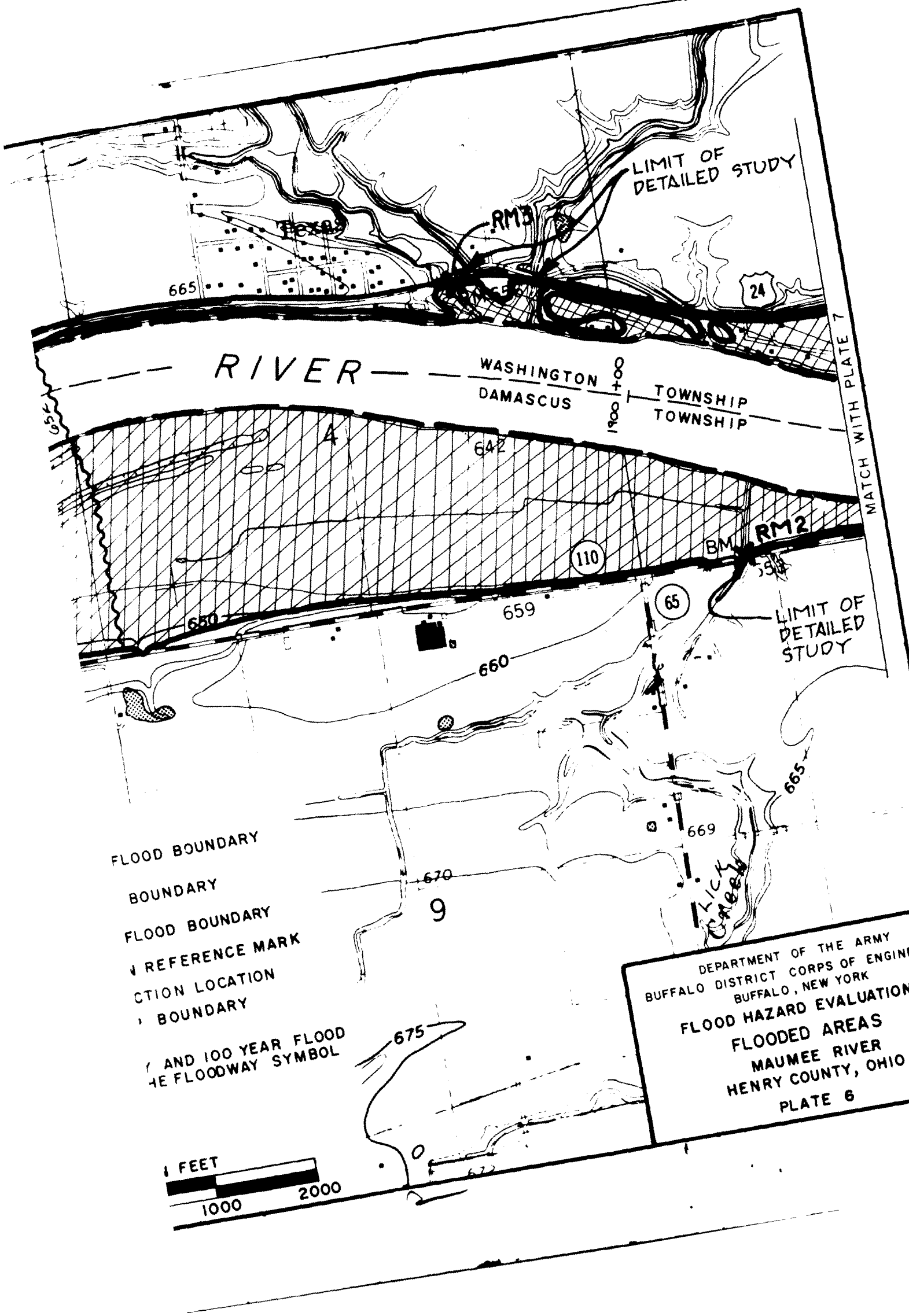
FLOODED AREAS

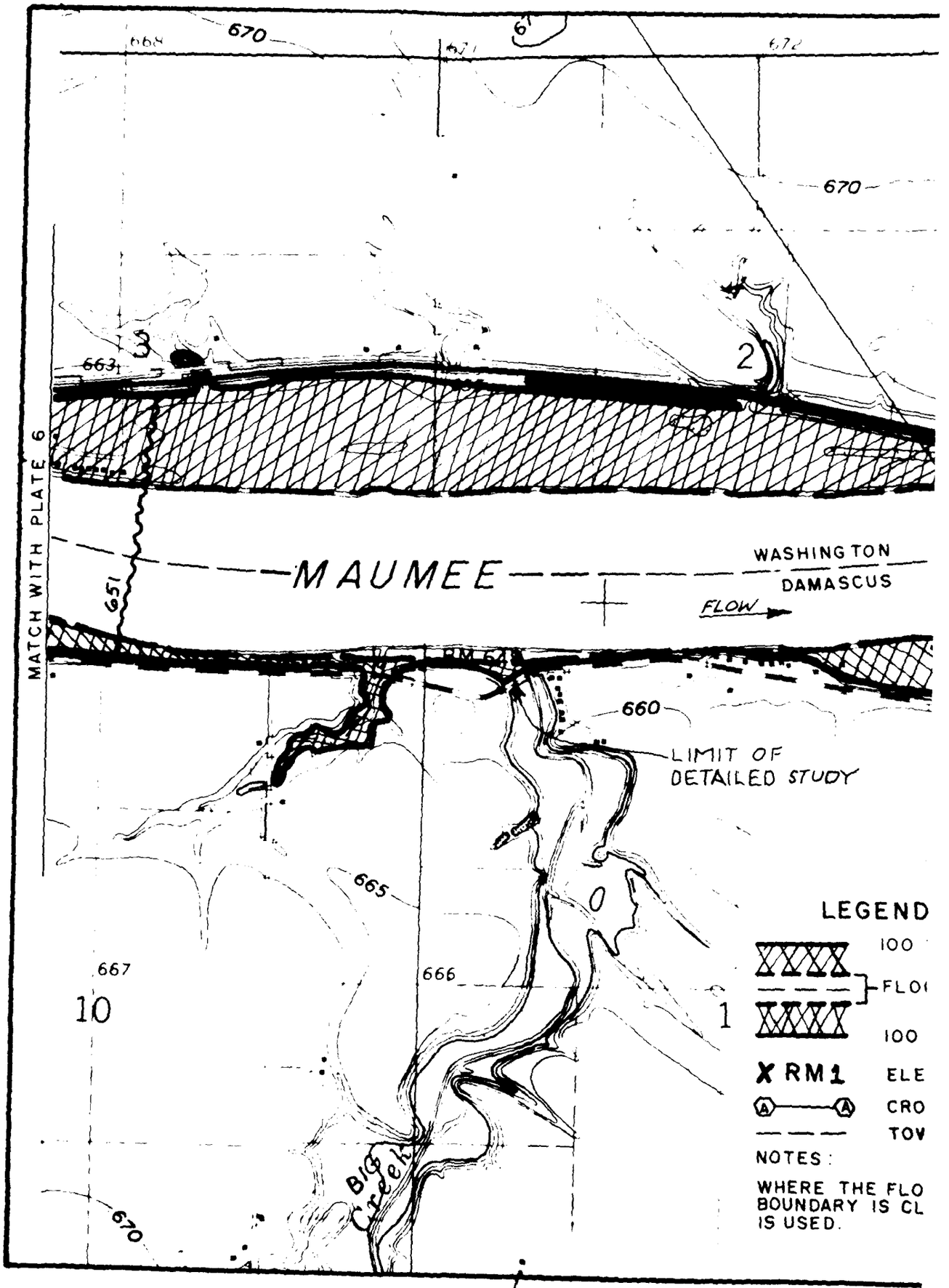
MAUMEE RIVER
HENRY COUNTY, OHIO

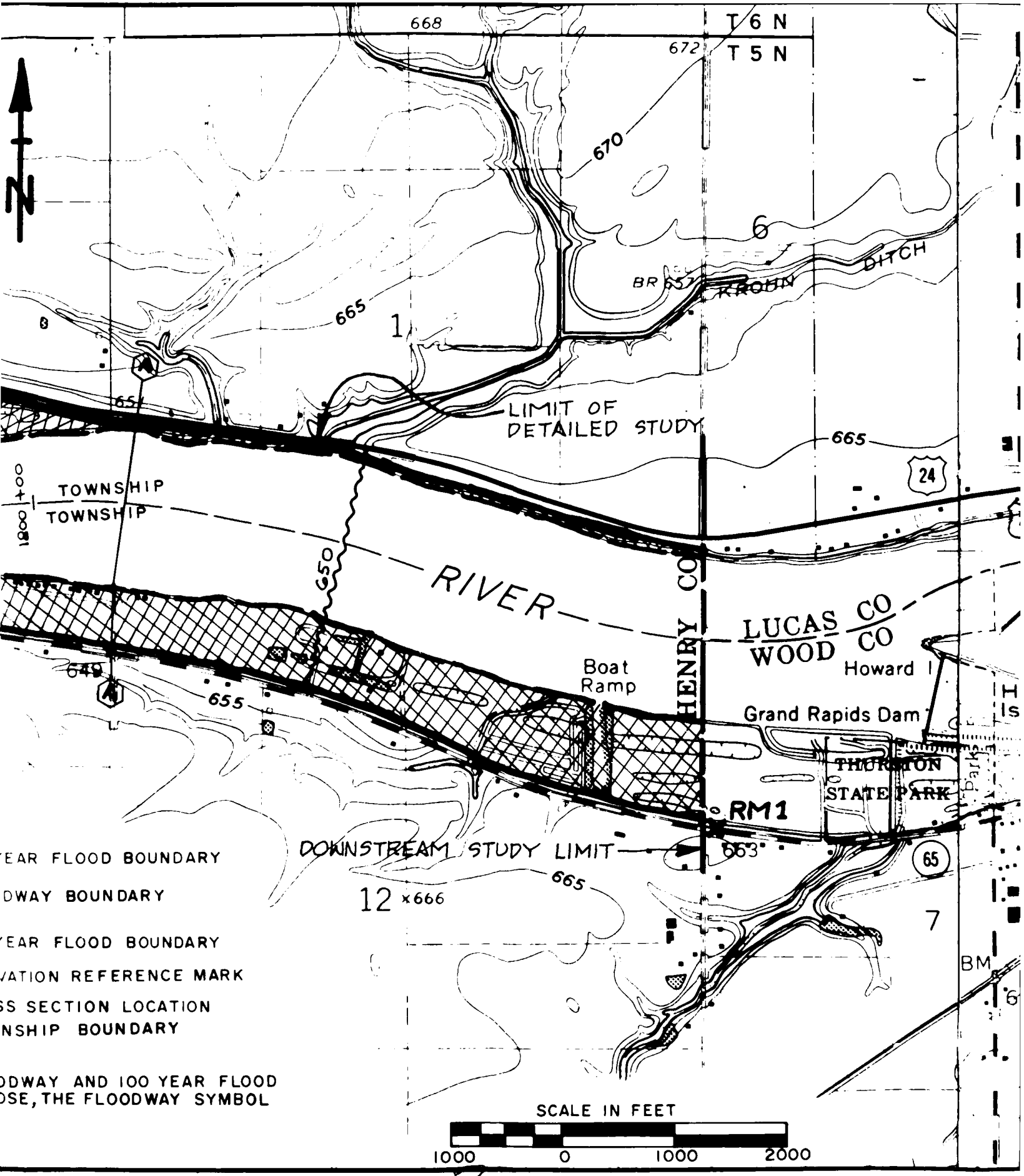
PLATE 5 9/87


669
666
RM50
Creek
N
6
668
667
666
5
LIMIT OF
DETAILED STUDY
LIMIT OF
DETAILED STUDY
665
FLOW
Creek
643
BM
RM4
665
24
660
MATCH WITH PLATE 5
7
675
MAUMEE
668
8
674
110
675
675
643.50
CREEK


RIVER
WASHINGTON
DAMASCUS
FLOW
652
642
650
659
660
665
670
675
110
LIMIT OF DETAILED STUDY
RM4
LEGEND
100 YEAR FLOOD BOUNDARY
FLOODWAY BOUNDARY
100 YEAR FLOOD BOUNDARY
X RM3 ELEVATION REFERENCE MARK
CROSS SECTION LOCATION
TOWNSHIP BOUNDARY
NOTES:
WHERE THE FLOODWAY AND 100 YEAR FLOOD BOUNDARY IS CLOSE, THE FLOODWAY SYMBOL IS USED.
SCALE IN FEET
1000 0 1000 2000


LIMIT OF DETAILED STUDY
RM3
665
24
RIVER
WASHINGTON TOWNSHIP
DAMASCUS TOWNSHIP
4
642
MATCH WITH PLATE 7
110
BM
RM2
659
65
LIMIT OF DETAILED STUDY
660
665
669
670
9
675
FLOOD BOUNDARY
BOUNDARY
FLOOD BOUNDARY
REFERENCE MARK
CTION LOCATION
BOUNDARY
AND 100 YEAR FLOOD
HE FLOODWAY SYMBOL
FEET
1000
2000
DEPARTMENT OF THE ARMY
BUFFALO DISTRICT CORPS OF ENGINEERS
BUFFALO, NEW YORK
FLOOD HAZARD EVALUATION
FLOODED AREAS
MAUMEE RIVER
HENRY COUNTY, OHIO
PLATE 6
9/87


668
670
672
670
663
3
2
MATCH WITH PLATE 6
651
MAUMEE
WASHINGTON
DAMASCUS
FLOW
660
LIMIT OF
DETAILED STUDY
665
667
666
10
1
Big Creek
670
LEGEND
100
FLO
100
RM1
ELE
CRO
TOV
NOTES:
WHERE THE FLO
BOUNDARY IS CL
IS USED.



EAR FLOOD BOUNDARY

DWAY BOUNDARY

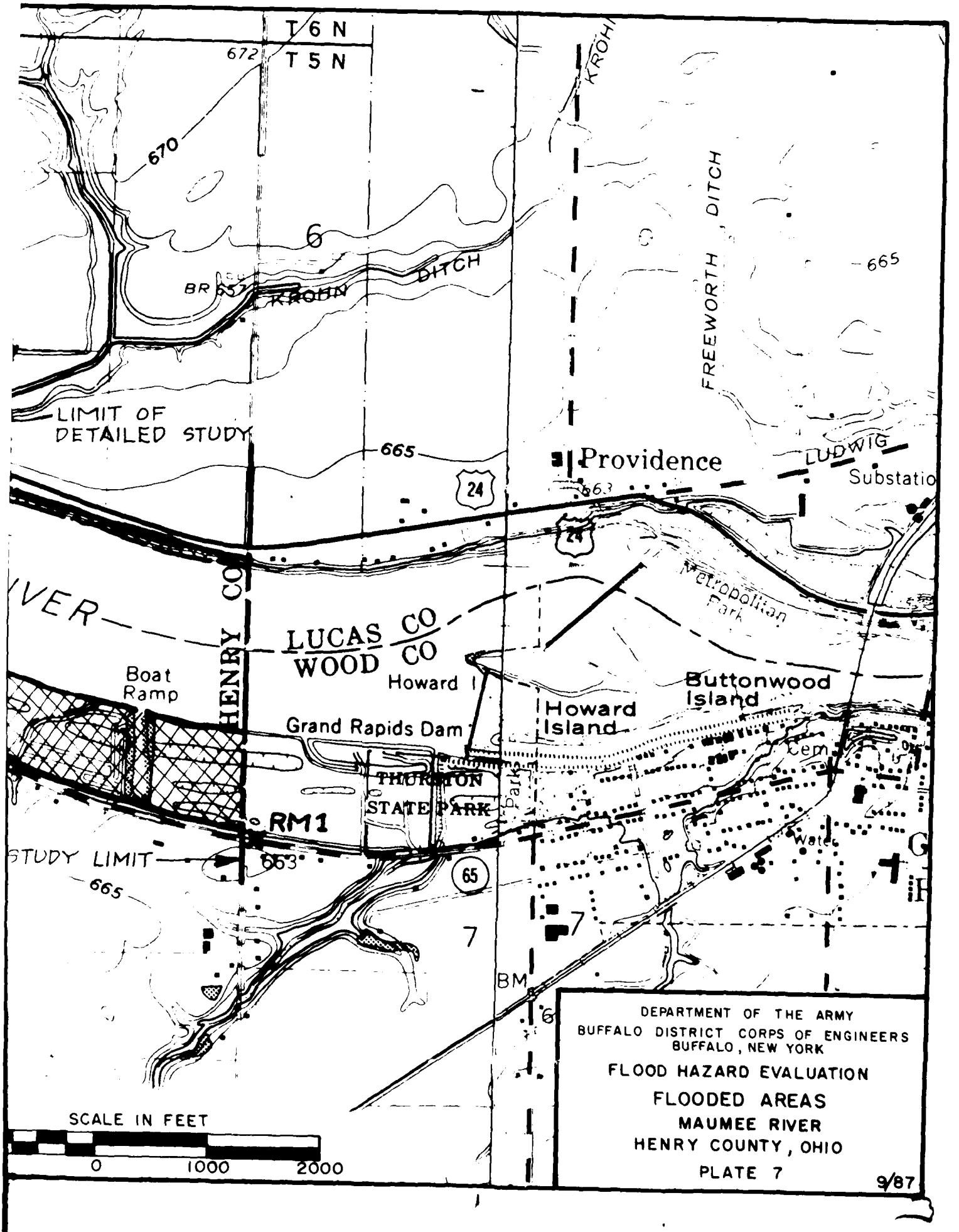
EAR FLOOD BOUNDARY

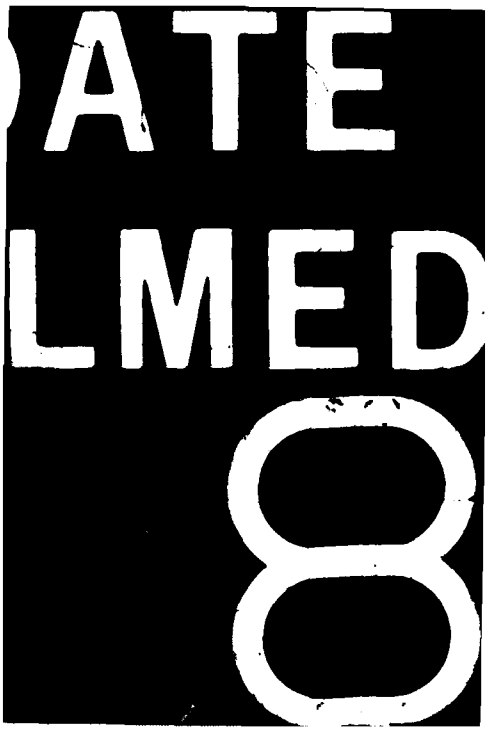
VATION REFERENCE MARK

SS SECTION LOCATION

NSHIP BOUNDARY

DDWAY AND 100 YEAR FLOOD
OSE, THE FLOODWAY SYMBOL


T 6 N
T 5 N
672
670
665
KROHN DITCH
FREEWORTH DITCH
LIMIT OF DETAILED STUDY
Providence
LUDWIG
Substatio
24
Metropolitan Park
LUCAS CO
WOOD CO
HENRY CO
Boat Ramp
Howard I
Howard Island
Buttonwood Island
Grand Rapids Dam
THURSTON STATE PARK
RM1
STUDY LIMIT
663
65
7
BM
6
SCALE IN FEET
0
1000
2000
DEPARTMENT OF THE ARMY
BUFFALO DISTRICT CORPS OF ENGINEERS
BUFFALO, NEW YORK
FLOOD HAZARD EVALUATION
FLOODED AREAS
MAUMEE RIVER
HENRY COUNTY, OHIO
PLATE 7
9/87


ATE
LMED
8